The AUTOMOBILE

New England—The Automobilist's Premier Touring Ground

30,000 Visiting Cars Toured The Six States This Summer

By J. T. Sullivan

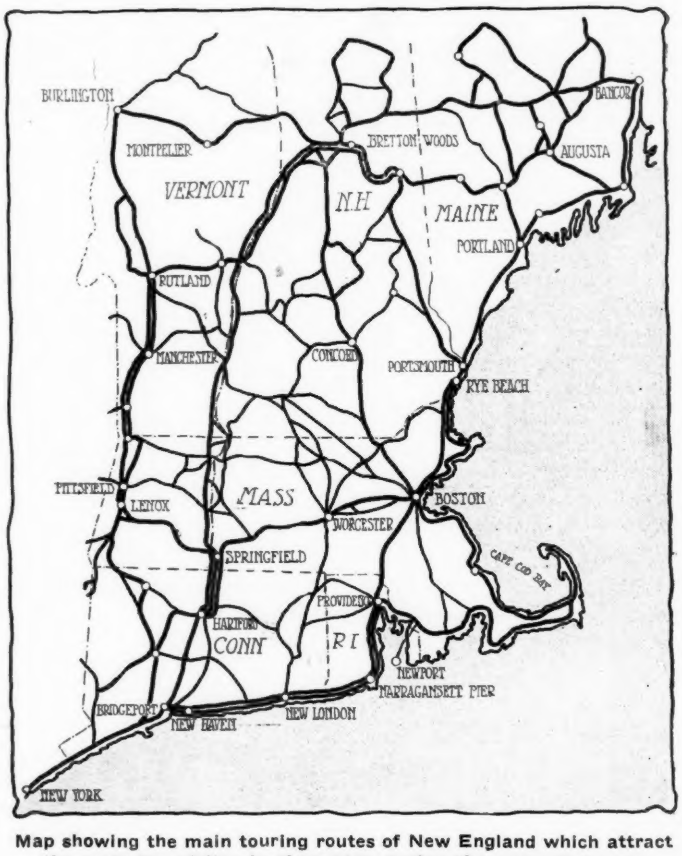
BOSTON, MASS., Oct. 20.—New England's motor season for touring is at an end as far as visitors from other states are concerned, and now it is possible to get some idea of what a large proportion of tourists invaded our section this season, and what a large number of motorists use their cars for inter-state touring.

It is no exaggeration to state that of the 1,250,000 automobiles owned in this country at present more than 12 per cent. of them, or approximately 153,000 machines were running over the roads of New England during the past few months. When the geographical area of New England is considered this is all the more remarkable. The total area of the six New England States is 66,424 square miles. In the United States there are nineteen other states each one of which is larger than all New England. Texas alone is more than four times the size.

Therefore, to pack into an area whose total is so comparatively small 12 per cent. at least of the entire total of automobiles in America is a real achievement. This figure is obtained by adding to the 12,000 machines registered in New England the 30,000 visiting cars that toured the six states this summer. These 30,000 represent approximately the cars from outside the section that crossed into the borders. According to an estimate based on careful calculations the cars and tourists who made inter-state trips this year in the territory total 88,925 cars, carrying an average of three people each, or 283,025 tourists. Allowing a similar average for the whole 153,000 it would mean more than 430,000 were touring New England this summer, this including, of course, the native motorists.

It is assumed that of the nearly 90,000 cars making inter-state trips, at least one-third, or 30,000, were from outside New England, leaving the other 60,000 to cover cars owned in New England and ones that went into all other states, thereby eliminating duplications in the final analysis of the 10 per cent. of all the cars owned in the country.

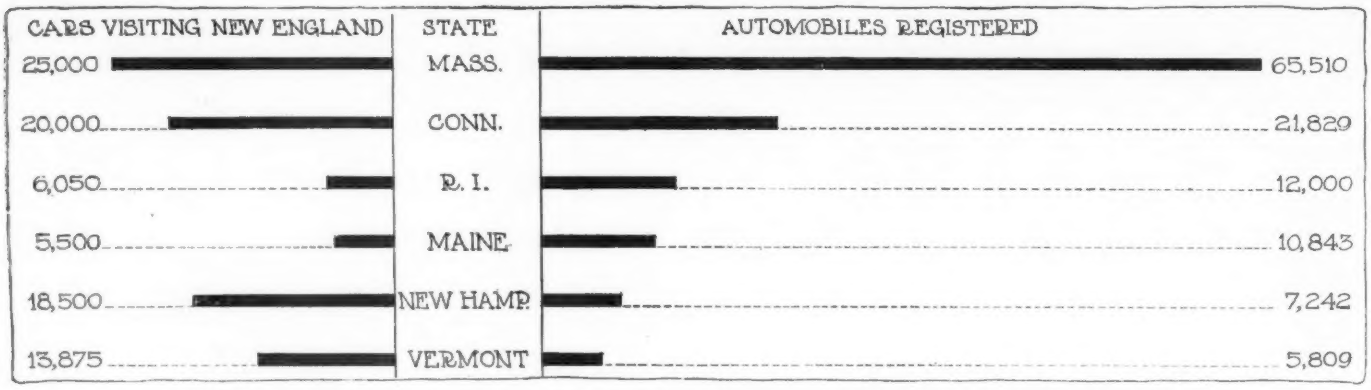
The compilation below shows the cars and motorists making trips into the New England states, including of course the same cars in many instances, but which must be counted when going from one state to another, as follows:



Map showing the main touring routes of New England which attract the motoring visitor in thousands during the summer season

State	Non-resident Machines	Motorists	Registered Machines
Maine	5,500	21,800	10,843
New Hampshire	18,500	55,500	7,242
Vermont	13,875	41,625	5,809
Massachusetts	25,000	75,000	65,510
Rhode Island	6,050	19,150	12,000
Connecticut	20,000	60,000	21,820
Totals	88,925	283,025	123,233

It is no exaggeration to say that there were approximately some 25 per cent. more cars and motorists visiting New England



Comparison of the relative number of visiting cars and native registrations of the New England States

this year than last, and that the number will grow constantly. Because of its geographical location, being the center of the section, and with the larger number of visitors, it is perhaps best to make a start with the Bay State.

This year the number of cars from other states totaled 950 as registered with the Highway Commission. This meant cars that were to stay in the Bay State more than 10 days. Last year there were 800 such machines registered. These visitors represented thirty-three states and three foreign countries. As it is not an extraordinary assumption to say that for every automobile so registered during the three summer months there were twenty-five other machines at least going through unregistered it makes a total of close to 25,000 automobiles for July, August and September alone. With an average of three to a car there were 75,000 visitors in the Bay State this summer.

Going north the motorists have taken the shore road to the Maine coast, where this year for the first time the roads were improved and conditions planned to give visitors a welcome. To see how they accepted it statistics were gathered on two of the important roads. Maine does not keep a record of visiting cars because that commonwealth allows visitors 30 days, and the visitors practically never use up the whole time. However, the Maine State Automobile Association decided to make some investigation as to visiting cars. The spots selected were ideal for the purpose.

One of these was the Portsmouth-Portland road. This is the direct highway leading north from Boston of the inter-state trunk line systems. All cars entering Maine from the south go over that road. The days selected were the first Saturday and Sunday in August. On that road the figures were:

SATURDAY, AUGUST 2, 8 A. M. TO 10 P. M.

State	Cars	People
New Hampshire	57	216
Vermont	2	10
Massachusetts	133	463
Rhode Island	8	26
Connecticut	10	42
New York	16	60
New Jersey	10	24
Pennsylvania	10	36
Maryland	4	14
Ohio	1	2
Michigan		3
*Extra	17	50
	269	946

SUNDAY, AUGUST 3, 8 A. M. TO 10 P. M.

State	Cars	People
New Hampshire	92	395
Vermont	4	16
Massachusetts	127	505
Rhode Island	8	34
Connecticut	8	31
New York	21	75
New Jersey	4	11
Pennsylvania	13	49
Maryland	6	20
Virginia	1	3
Ohio	1	4
Michigan	2	8
California	1	3
Quebec	2	8
*Extra	4	22
	294	1184

*Too dark to read state plates.

The other station where records were kept was on the road between Fryeburg and Bridgeton, where the cars leave the state going to New Hampshire or come into Maine from the White Mountain state. Here a tabulation of automobile and passengers entering the state was kept, and figures of those leaving were totaled. These figures show that the following cars entering Maine via that road, which is one of the main trunk lines between the two states:

SATURDAY, AUGUST 2, 8 A. M. TO 10 P. M.

State	Cars	People
Maine	17	48
New Hampshire	19	65
Vermont	2	9
Massachusetts	15	48
Rhode Island	3	10
New York	2	9
New Jersey	1	2
Pennsylvania	7	24
Maryland	1	5
Indiana	1	3
Iowa	1	7
Quebec	2	9
Total	71	239
Leaving Maine	68	250
Totals	139	489

SUNDAY, AUGUST 3, 8 A. M. TO 10 P. M.

State	Cars	People
Maine	36	138
New Hampshire	22	92
Vermont	3	12
Massachusetts	6	23
Rhode Island	2	8
New York	7	31
New Jersey	1	3
Michigan	1	5
Quebec	3	12
Total	81	324
Leaving Maine	81	315
Totals	162	639

ENTERING MAINE ON 2 DAYS

	Cars	People
Maine cars	53	186
Other cars	662	2507
Totals	715	2693

These figures give a good idea of the motor travel into Maine, for the figures are consistent when compared with those taken a week previous and one preceding that, on the road from Boston. These figures showed an average of 200 cars on each day of 3 such days carrying about 875 passengers. So August was expected to show a little higher total. Therefore, allowing for September to drop and averaging 10 weeks for the real touring season one may estimate the visitors for the season. Allowing 10 Saturdays and 10 Sundays, and averaging 225 automobiles entering Maine by way of Portland with an average of 900 people it gives 4,500 cars with 18,000 motorists. Add to this the same 20 days of cars entering from the White Mountains coming from Bretton Woods and that would be about fifty cars a day, with an average of 190, giving 1,000 machines and 3,800 people. So the total for the season of out-of-the-state cars would be 5,500 machines with 21,800 tourists.

That such figures are not out of proportion is shown by the figures kept at the Poland Spring hotel just above Portland, Me.

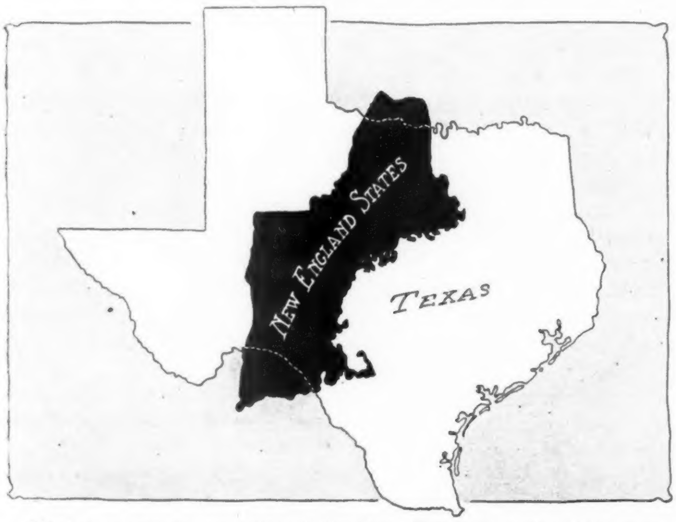
Nearly all the cars making the Ideal tour trip visit the Poland Spring hotel either going to or returning from the White Mountains. So they have kept a record of the cars and guests for the past two seasons that is interesting. Here it is:

	Cars from other States	Maine cars	Total cars	Total motor guests
1913..........	919	405	1324	3953
1912..........	840	380	1220	3120

These figures show a consistent gain all along this year over the figures for 1912. As the Maine roads were in poor shape last year many motorists who headed for that place turned back. Now with the new highway commission and the new bond issue going through, allowing $2,000,000 for roads, it is a different story.

New Hampshire is known as the Switzerland of America, and naturally thousands of motorists go to that state every year. There is a constant stream of cars swinging around the Ideal tour route, while many come in from the North by way of Canada.

There is a 10-day limit on motorists in that state similar to the Massachusetts law, and so visitors have to register. Last year



Almost as many cars visited the New England states this summer as the total registration of Texas, which is four times the area as shown above

the non-residents registered were 848, and this year the figures have jumped to 1,157. That is a larger figure than even Massachusetts shows, but this is due to the fact that many Vermonters doing business in New Hampshire have to cross the Connecticut river frequently, and so they take out a yearly license.

By comparing the figures of the automobiles leaving Maine at Fryeburg one gets some idea of the visiting machines. Just outside Fryeburg is the New Hampshire line, and so cars leaving that town are destined for New Hampshire. Therefore the Maine census showed an average of seventy-five cars entering the Granite State from Maine in that direction on the Saturdays and Sundays in the summer. They carried an average of 280 people. So that gives for the 20 summer Saturdays and Sundays an approximate of 1,500 cars, with 5,600 people, just entering by that point. It would be no exaggeration to assume that an equal number at least entered on the other side, for the figures leaving the state at that point are nearly similar. That would be 3,000 cars with 11,200 motorists.

Taking the 1,157 non-residents registered, and allowing about fifteen automobiles that do not register for each registered one, assuming that not as many visit New Hampshire as enter Massachusetts, and it gives a total of approximately 18,512 cars, including the registered ones, and with three motorists to a car it would make 55,536 tourists.

Some idea may be gleaned also from the hotel figures. At the Mt. Washington hotel, Bretton Woods, the total automobile registrations have not yet been compiled. However, Manager D. J. Trudeau made out some averages that are interesting. He estimates that the increase in cars is about normal over other years, and that for the 1913 season it averaged 2,000 cars for the season. These were cars that were registered for a stay of more than a mere meal. His garage statistics show that the total garage figures would estimate the caring for machines figuring 7,000. There were days when the arrivals by motor car swamped those reaching there by train. For instance, August 2 there were twenty-five cars carrying ninety-four people; August 22, in twenty-two cars came seventy-eight people, and September 27 there were thirty cars with ninety-six people. On the latter day only ten came by train. These people were guests who came to stay. There were any number of days when more than 100 cars rolled up to the hotel bringing people to luncheon.

More statistics were available at the Profile house, where Everett L. Rich kept record of cars. His hotel was open during July and August. From his place there are two through roads, one going to Bretton Woods and the other going to the Flume. It became known that Mr. Rich not only kept record of the cars but entered the number of every machine, and its owner and occupants, so several times he got telegrams and long distance telephone calls from people anxious to locate business men who were wanted in New York, Boston and elsewhere, and by means of his records he was able to locate the people. Here are the statistics he kept:

	To Flume	To Bretton Woods	Stayed at Profile Ho.
July	1310	1334	581
August	1889	1890	924
Totals	3199	3224	1505

This gives a total of 7,928 cars passing this one spot in 2 months, and it would show approximately 24,000 tourists. If there were only 25 per cent. from other states it would aggregate close to 2,000 cars with 6,000 visitors. So the figures for a state-wide average as given previously is not very far from the true basis.

Vermont does not keep any record for the visiting cars as separate from the Vermont machines. Her reciprocity law is the best of the group. However, as that state has its hills, mountains and lakes, and good roads, it is visited by thousands of motorists every year who are not Vermonters. An effort was made to secure some information from the hotels along the Ideal tour route as to the motor traffic, but the inquiries were not answered. So a general average must be made along other lines. The best basis would be on the New Hampshire figures. Many Maine motorists cross into New Hampshire and many New York motorists cross into Vermont. So assuming that 75

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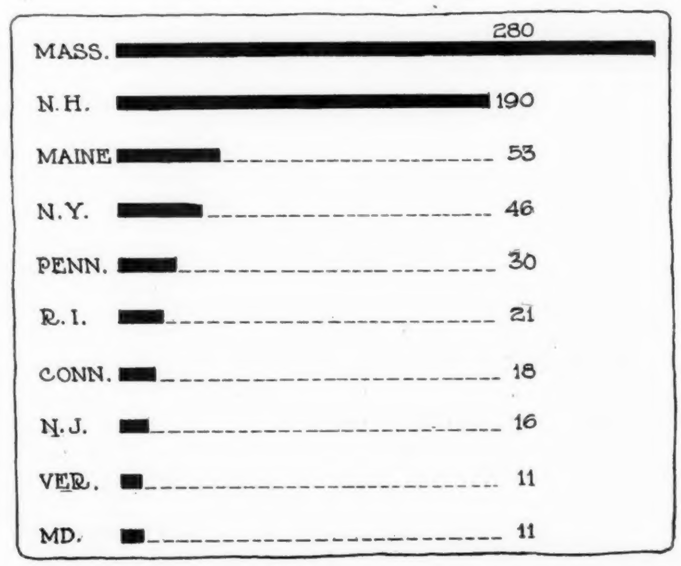


Number of automobiles entering Maine from the various states named during 2 days, a Saturday and Sunday in August

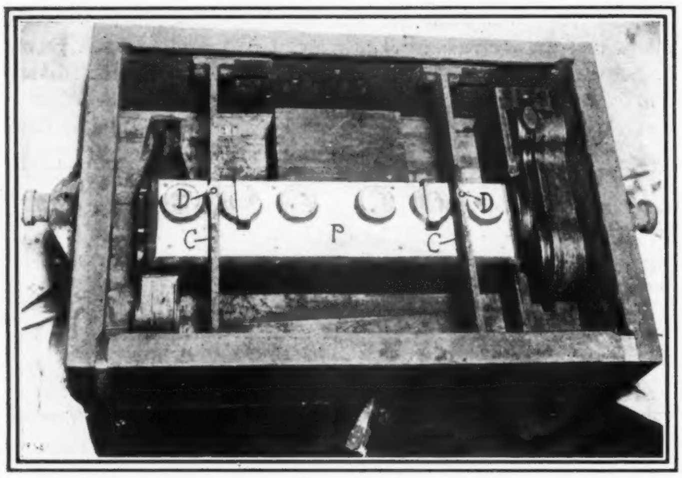


Fig. 1—Foundry flask in Marmon factory, showing cross bars C receiving dowel pins D in order to properly locate the pattern in the flask. P is the pattern which assists in forming the upper part of the crankcase

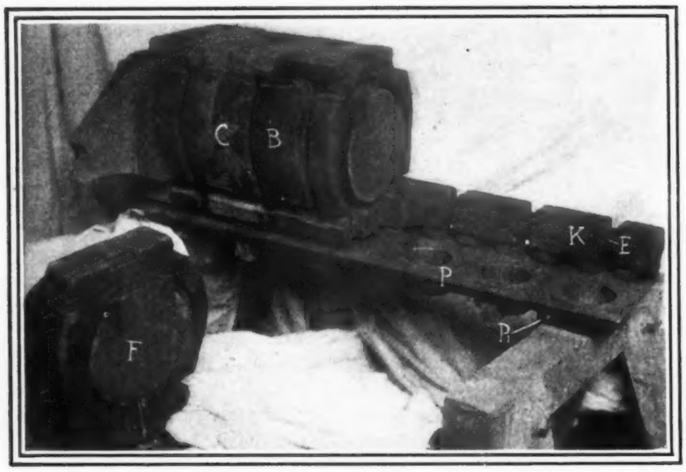


Fig. 2—Using a metal plate P on which the sand core pieces F are mounted in order to obtain accuracy in castings. It is essential that the core forming the opening in the center of the crankcase as well as forming the holes for the camshaft and crankshaft bearings be accurate. The plate shown is for a six-cylinder motor and the three large holes in the foreground show the cylinder openings

Marmon Accuracy And How Obtained

Special Machines Used in Making Many Parts—Jigs Used in Foundry —Other Methods To Get Accuracy

VERY rarely has the buyer of a high-class car any definite conception of what the car maker has spent on obtaining the accuracy necessary to constitute a high-standard machine. The buyer knows that he pays perhaps $1,000 more for his car than he would pay for a car of another make with equally long wheelbase, with as large tires, with the same make of motor starter, with the same lighting equipment and with as large cylinders, but why he has paid the extra $1,000 he cannot answer, further than that "it is a better car."

He rarely knows how it is better, where it is better or why it is better.

The car maker, who spends money to get the final syllable in accuracy in the size of parts in the motor and gearset, knows the value to the car owner of such. So does the car maker with his chemical and physical research laboratory, where days and months and years are spent in analyzing metals to get the best bearing for a crankshaft. So does the maker who makes tests from all metals entering into the important parts of his car such as axles, steering parts, crankshafts, gearset shafts, etc. So does the maker with his large inspection department in which parts are inspected with micrometers to detect the one-thousandth under or over size—and all simply to put out a machine that will last, not one that will wear out in a year or 2 or 3 or 4, but one that will wear without getting noisy, and one with that grade of metals in the vital parts that will stand up in the crucial test.

Accuracy costs money. Nordyke & Marmon, Indianapolis, Ind., have spent over $40,000 for jigs and some special machines that have been made solely to give the closest accuracy for its 1914 passenger cars. This money has been spent in fixtures and equipment before a single car could be completed to insure the best casting being made in the foundry; in special machines to make the crankcase the most accurate; in machines

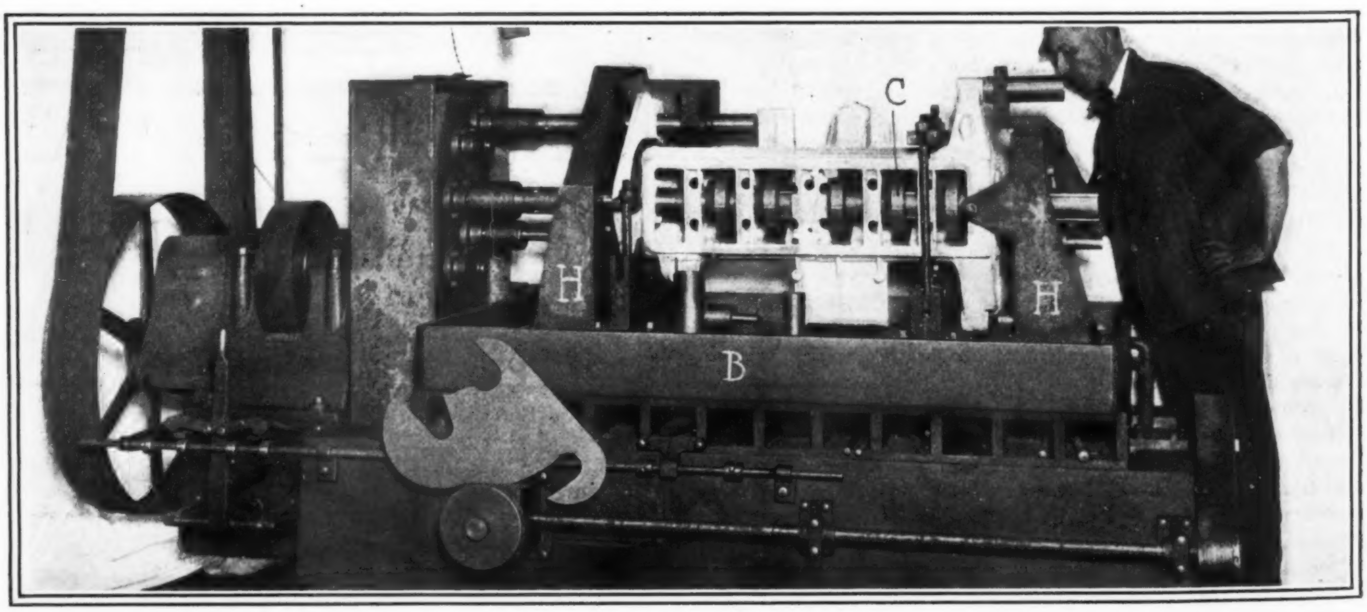


Fig. 3—First operation on Marmon crankcase, showing special machine boring all of the crankshaft and all of the camshaft bearings at one time

to maintain accuracy in finishing the cylinder casting; machines to make quiet gears; machines to make accurate connecting-rods; jigs to properly mount the motor and gearbox in the frame; and other jigs and machines going through the gamut of manufacture, and all for accuracy—accuracy that the eye cannot detect, but accuracy discovered only by the deftness of the micrometer and the weighing scales. This accuracy costs money, but it makes cars that wear, cars that wear long and cars that keep quiet.

The following illustrations, taken specially for THE AUTOMOBILE in the Marmon plant last week, show a few only of the various means taken by this company to get accuracy in its 1914 cars, the program starting with the foundry and ending only when the car goes out of the final inspection department.

Accuracy Must Start in Foundry

To get a good motor means a stout, accurately made cylinder casting as well as a stout, accurately made crankcase. To get such takes you to the foundry, and as the Marmon company makes all its castings it is possible to get its own desired range of accuracy. Accuracy in a casting means having the walls of uniform thickness. For example, the wall of a cylinder should be of even thickness on all sides. Whether or not it is depends on whether the core has shifted in the casting process, the core being sand filling the waterjacket and other spaces of the casting. In the crankcase the core fills the entire center of the case as well as the opening where the bearings come.

During the past fall the Marmon company has instituted new foundry process of methods by which this accuracy is obtained. Fig. 1 shows a metal flask end in which a crankcase casting is to be made. In the bottom of it is shown a pattern P which will be recognized as assisting in forming the upper part of the crankcase. It is necessary for accuracy to be sure that this pattern is properly positioned in the flask before the sand is put in over. To do this, the flask has rigid metal cross pieces C and the pattern metal dowel pins D which fit in the reamed holes of these cross pieces so that with the pins in the holes there is no possibility of putting the pattern any way but the right way in the mould.

It is next essential that the core forming the opening in the center of the crankcase, as well as forming the holes for the crankshaft and camshaft bearings, be accurate. To do this, the baked core pieces are mounted on a metal plate P, Fig 2,

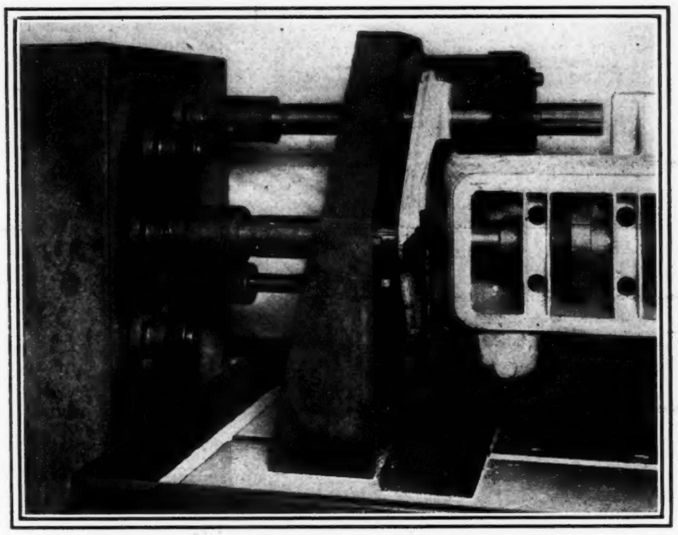


Fig. 4—End view of machine in Fig. 3, showing gearbox

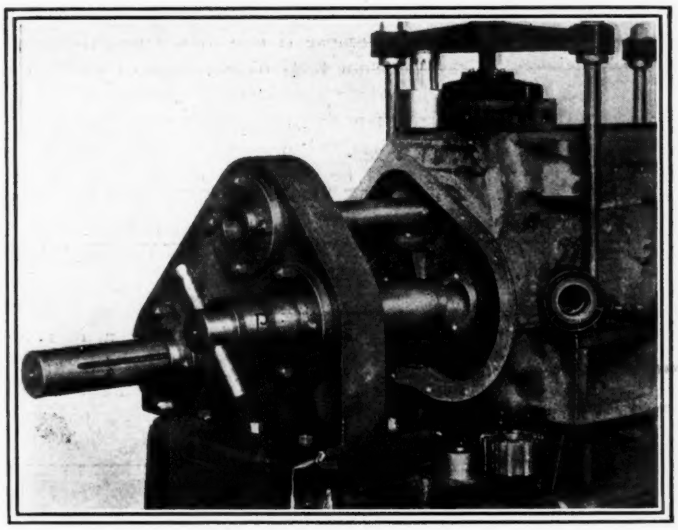


Fig. 6—Showing locating pin P for line reamer for bearings

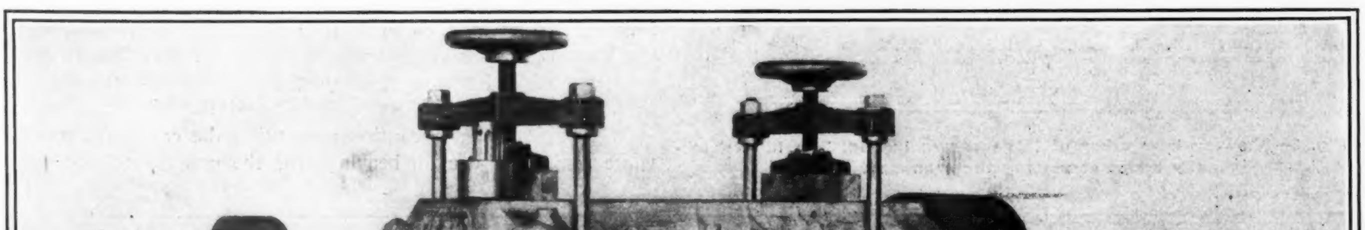


Fig. 5—Line reaming fixture for reaming bored openings for carrying camshaft and crankshaft bearings

this core plate having holes accurately positioned to take the different core pieces. This plate is for a six-cylinder motor and the three large holes in the foreground show the openings which the three cores will eventually occupy. Each crankshaft bearing will be formed between the core pieces B and C, and the entire camshaft opening by the core pieces K and the camshaft bearing at the points E. F shows how the core is built up in pieces.

To understand why accuracy is obtained by this method of core assembly it must be remembered that ordinarily the core pieces F are placed direct in the flask, Fig. 1, and are not mounted on a metal plate such as P. Consequently there is an opportunity for failure in proper alignment of the core pieces, which will mean variation in the thickness of the casting or inaccuracies in the exact location of the casting parts which will carry the bearings. When the core plate is eventually lowered into the flask, its dowel pins, P1, fit into the locating hole D, Fig. 1, so that its relative location in the flask is as accurate as that of the pattern.

Making the Crankshaft Bearings

With the accurate casting made in the foundry it is next essential that each successive step in the finishing of this casting be of consistent accuracy, because if one of the manufacturing processes goes astray the sum total of accuracy of the job is sacrificed. The first job done on the casting after it comes from the foundry is that of boring the holes forming the crankshaft and camshaft bearings, Fig. 3. The crankshaft is the heart of the motor, it must be accurately mounted and if the motor is to give its best results all other parts must be in accurate relationship with it. In one operation this machine bores the seven holes for the seven bearings in the crankshaft, and also seven holes for the seven camshaft bearings, and also one bearing for the magneto shaft, making in all fifteen operations going on simultaneously. Two hours and a half are needed for the job.

This is a new machine specially designed by the Marmon people for this work and installed 1 year ago. Its object is accuracy, for by having these fifteen bearings bored with one setting and at one time, it is certain to have them all parallel which is quite necessary. But this machine has further use in that by putting on new heads or end pieces H you may use this for boring the crankcases of different models.

The cutters C doing this work run at a speed of 75 to 90 revolutions per minute, and when the bearings are being bored the bed B carrying the crankcase, together with the end pieces and the crankcase as well, travels endwise by an automatic feed arrangement. In order to get accuracy the cutters are examined before starting on each crankcase.

The crankcase is centered on the machine from bosses and sight locating pins at the upper right, and is held down to the bed at the left end, the same as it is held in the chassis, the object being to meet chassis conditions as closely as possible in this manufacturing process.

Some conception of the value of this machine and the work it does in accuracy may be gleaned from the fact that previous to its introduction the crankshaft bearings were bored on one machine; then the crankcase was taken off and located on another machine and the camshaft bearings bored. This double setting up and adjusting on different machines gave an opportunity for inaccuracy and lack of parallelism between camshaft and crankshaft bearings.

The value of getting the crankshaft and camshaft bearings accurate is still more important in that on every other machine in which the crankcase is worked on afterwards it is located on the machine from the crankshaft and camshaft centers so that, with these centers originally right and all future locating done from them, the possibility of error is eliminated.

But these crankshaft and camshaft bearings are not yet complete. They are not yet accurate enough and must be reamed, that is, given a final finishing. To do this a machine has been developed, the line reaming fixture, Fig. 5, in which a long bar B with a set of seven reamers or cutters C is inserted into the camshaft opening, each reamer finishing a bearing; and in which a set of larger reamers K is carried on a bar which is inserted into the crankshaft opening, one reamer for each crankshaft bearing. These reamers or final cutters are rotated by hand, 30 minutes being needed to add this final touch to the crankshaft and camshaft bearing openings.

Crankcases Set on Locating Pins

When this line reaming job is undertaken the crankcase is placed on the blocks and lined up from the camshaft hole by a locating pin P at each end; it is then anchored. This done, the locating pins are removed and the line reamer B with seven reamers on it inserted through the bushings of the locating pins. The reamer is then removed, and the locating pins reinserted, this latter precaution preventing the case from moving while reaming the main bearings for the crankshaft, and while

Fig. 8—Showing how arbor of lathe shown in Fig. 7 is hinged to readily admit of placing the crankcase on it

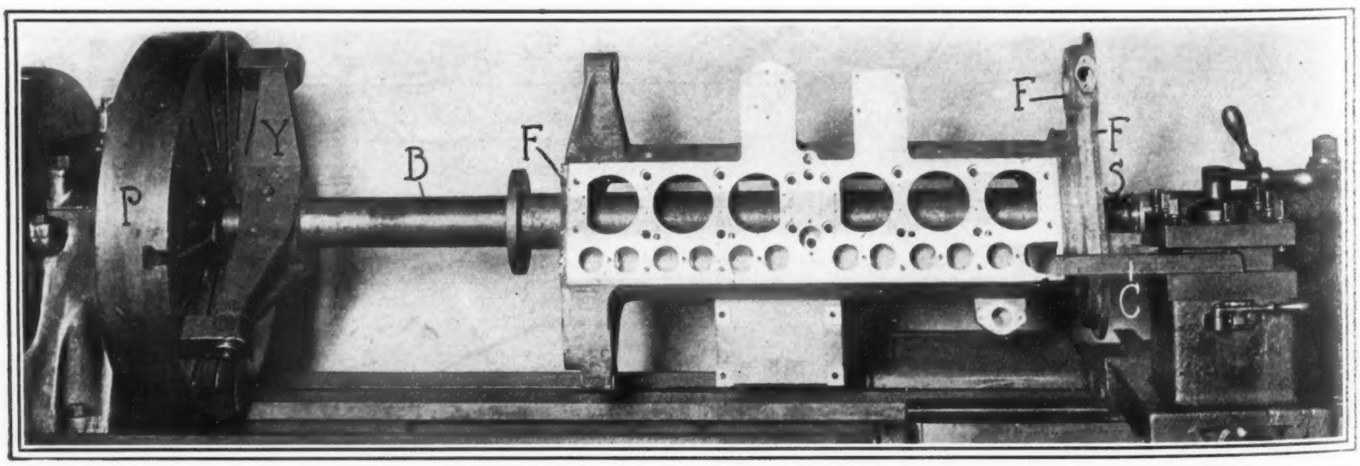


Fig. 7—Marmon uses a lathe for facing off the ends of the crankcase by the cutter C

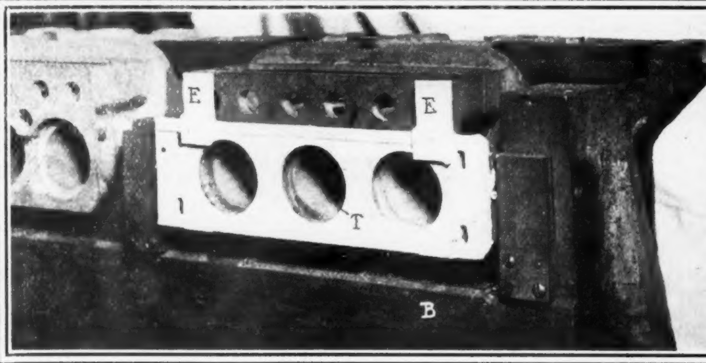


Fig. 9—Templet fitted to determine proper location of base of Marmon cylinder casting on milling machine

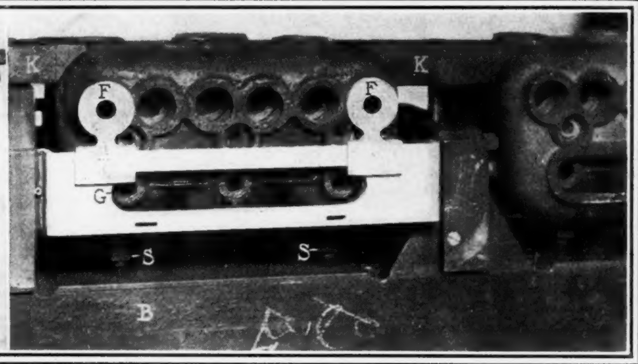


Fig. 10—Templet fitted to determine proper location of head of Marmon cylinder casting on milling machine

inserting the reamer for this work. This main reamer is inserted from the rear, and the separate reamers K added through the top of the case. To get accuracy the reamer bar is carried on four main bearings to avoid any possibility of springing. Each reamer K is a taper fit on the bar in order to make sure that they are regularly hitting on the six bearing surfaces.

In order to have a crankcase that properly assembles, the front and rear faces F, Fig. 7, must be at right angles to the crankshaft and the timing gear cover must fit accurately in order to avoid oil leaks. To make sure that the end faces are formed at right angles to the crankshaft, the Marmon company uses a 30-inch heavy-duty lathe instead of doing the work on a milling machine, as is often the case. The casting is supported on a 5-inch arbor, B, which fits into the two end crankshaft bearings. This arbor is mounted on a metal hinge Y at the left end of the face plate P of the lathe so that it can swing in or out. This leaves the work on centers as used for accurate machining. At the right end it is carried on a conventional self-centering support at S. Once positioned, the entire crankcase is revolved with the arbor, and the tool C finishes their surfaces at right angles. Fifteen minutes are needed for each end of the case. Fig. 8 shows how convenient it is to swing the arbor to the side when fitting the crankcase to it.

Before any operations are begun on the crankcase such as boring crankshaft or camshaft bearings, milling faces, etc., the interior of the casting is chipped out and cleaned in order to remove all particles that might become loose during the life of the motor and perhaps get in the bearings and ruin it. As a still further precaution, the entire inside of the case is painted or enameled with a metal primer. This is then baked at a temperature of 200 degrees for 2 hours, the object of this being to insure that the primer enters the pores in the case and gets away from all possible porosity. The heating of the casting for this length of time relieves the strains in the metal caused in the casting process.

Machinery Started Accurately

After you have accurate cylinder and crankcase castings from foundry with uniform thickness of wall as required, and with all openings such as cylinder bores, valve openings, etc., in the correct place, it is first of all necessary that all machining operations be accurately started on these castings. Figs. 9 and 10 show a fixture containing three cylinders mounted ready for the first operation, that of milling tops and sides after bottoms. Properly setting these castings on the machine for this operation must be carefully done. It is common practice to intricately mark out with white paint on a casting exactly where the milling must be done, this work being ordinarily known as the laying-out job. Marmon does not lay out cylinders in this way, but rather uses templets T for the tops and bottoms of the cylinder casting and the proper locating is done from these templets, which are carried on the bed B of the machine. The templet, Fig. 9, has three openings which correspond with the cylinder bores and other extensions E which

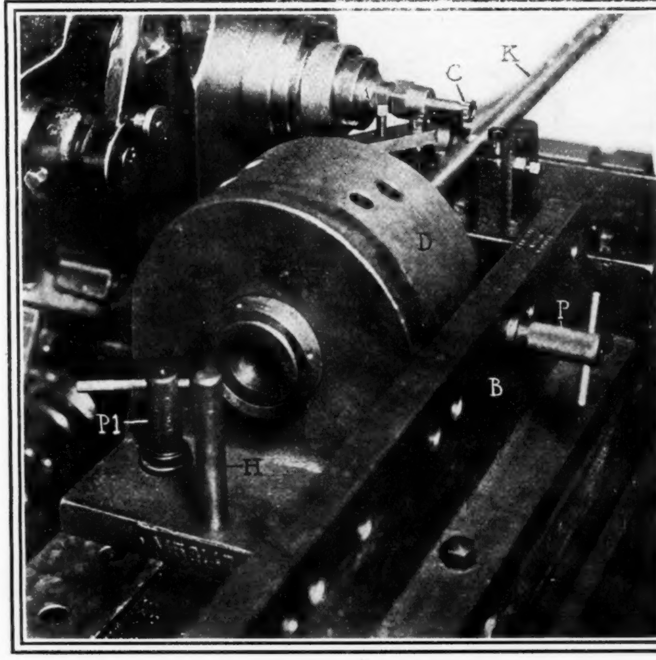


Fig. 11—Special machine developed by the Marmon company to cut keyways for camshaft

line up with certain parts of the casting. The templet for the cylinder head has circular parts F which correspond with parts of the casting as well as an oval opening G to correspond with the openings over the cylinder heads. By means of these templets the casting is properly adjusted by a series of screws S on which it rests as well as with the assistance of anchor plates K on top. Each casting is located so as to give the best coincidence with these templets, the law of averages being utilized in this work. The casting is thus located from the top and bottom with the object of leaving the best uniform thickness of cylinder walls. This method of locating cylinder castings has been in use for 1.5 year and has been found to give better results than the older method of laying out the cylinder and locating from some one point. The result attained by the templets, and law-of-averages method, is a more uniform thickness of walls after the various cylinder boring, milling and other operations are completed.

Camshaft Has Separate Cams

In order to insure the best accuracy in manufacture of the camshaft as well as in the mounting of it, the Marmon company uses its camshaft with separate cams, the object being that, by having the cams separate, the shaft can be mounted on non-split bushings, thereby insuring a more accurate mounting of the shaft and more uniform wearing possibilities and better valve

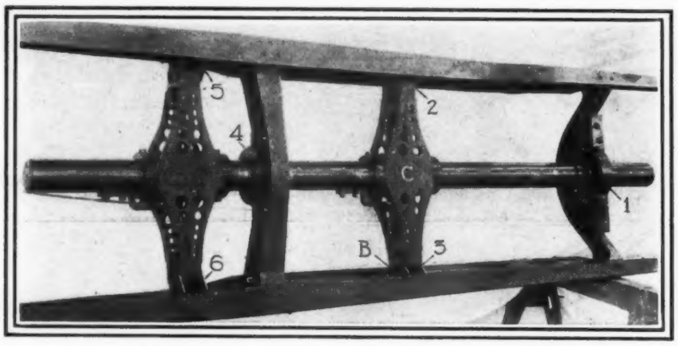


Fig. 12—Jig introduced by Marmon company for drilling frame to mount motor and gearbox, both of which are carried on the three-point suspension system

timing. To be sure that the valve timing is correct the cam setting must be correct and to do this the work must be done by an accurate dividing machine. Marmon has designed a special index head D and C, Fig. 11, which automatically determines the position of the cams on the camshaft K so that the cutter wheel C which makes the keyway for each cam always insures correct location of the keyways. This is accomplished by an index plate B on the top face of which are cross lines marking the setting of the index head D for cutting keyways for any cam such as inlet No. 1 cylinder, etc. This is done by a located pin P immediately underneath the instructions on the keyboard. This pin P enters a corresponding hole in the drum D only when the drum is rotated to that hole which is also marked Inlet Valve No. 1 Cylinder. The carriage carrying the drum D has a handle piece H by which it can be moved to the required position to cut Inlet Valve No. 1 Cylinder where it is anchored by the pin P1. This done, the drum D is then revolved, revolving the camshaft with it, until in a proper position to be anchored by the pin P.

Fig. 12 shows the large jig needed to make certain that the holes drilled in the frame for supporting the motor and gearbox as well as the brackets which must be attached to the frame carrying these parts are accurately mounted. To understand this jig it should be remembered that both motor and gearbox are carried at three points, the motor at a trunnion 1, Fig. 12, in front and on frame brackets 2 and 3 at the rear. The gearbox is carried on a trunnion 4 in front and brackets 5 and 6 in rear, the support of each being identical. In order to get the proper alignment of the crankshaft and gearbox shaft it is necessary that points 1 and 4 be in alignment and that the holes drilled in the frame cross members for supporting the trunnions are accurate. It is equally important that accuracy be observed in the mounting of brackets 2 and 3 and that the holes drilled in these be accurate. These supporting brackets B are loosely fitted into the frame channel and properly located from the jig cross-piece C in the ends of which are fore-and-aft holes marking exactly where the bracket must be drilled in order to take the bolts which attach the motor legs to these brackets. The holes for mounting the bracket on the frame are also marked, and the riveting done so that when it comes to assembly both motor and gearbox must positively slip into place without any clipping or adjusting and when they are fitted it is done with the assurance that the crankshaft and gearbox shafts are in perfect alignment. This jig has been in use a little more than a month.

Fig. 13 shows a multiple spindle drill with twenty-nine spindles used for drilling all of the holes in the top of the crankcase, or in the bottom of the crankcase as shown in Fig. 14, there being a separate jig plate J with the necessary bushed holes to receive the drills for the top and the bottom. To get accuracy and to be sure that these holes are drilled in proper relationship to the crankshaft bearing, it is necessary to locate this jig from the crankshaft. This is done by inserting in the crankshaft bearings an arbor with ends A exactly fitting into the bearings. The jig plate is then aligned from this arbor by means of straddling yokes on the under face of the jig plate, these yokes spanning collars on the arbor, these collars locating the jig accurately for endwise and sidewise positions. The face of the crankcase having been previously faced off in correct relationship with the crankshaft, the final word in accuracy so far as drilling the various holes for mounting the cylinders or attaching the crankcase base has been accomplished.

Value of System in Small Machine Shops

The successful results that follow the practice of systematic machine operations in large factories are well known. But it does not seem to be sufficiently realized that even the smallest plants could produce more economically if a definite system of procedure were adopted. The fact that there are many systems in vogue designed primarily for large production does not prevent the smaller manufacturer from adapting from these the details which could easily be made to meet his peculiar needs and conditions. The location of machines in sequence so as to avoid too much trucking of parts about the floor of the shop is only one of the many opportunities for adding to efficient production that are often overlooked.

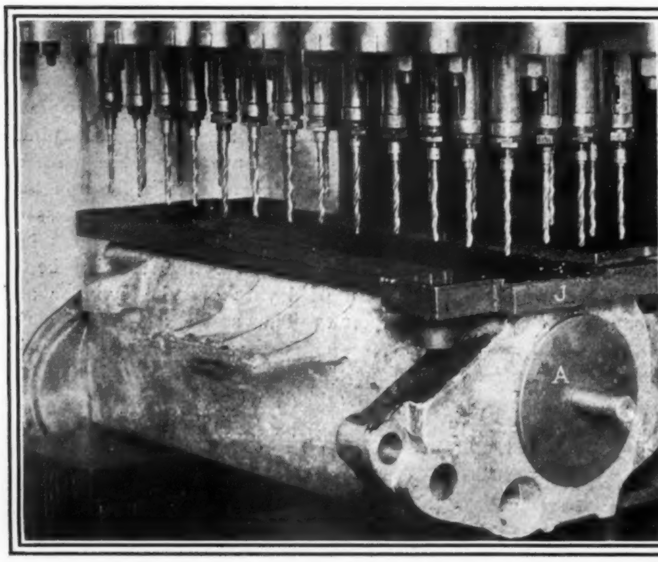


Fig. 13—Jig J, for drilling base of Marmon crankcase, this jig being located upon an arbor occupying the crankshaft position

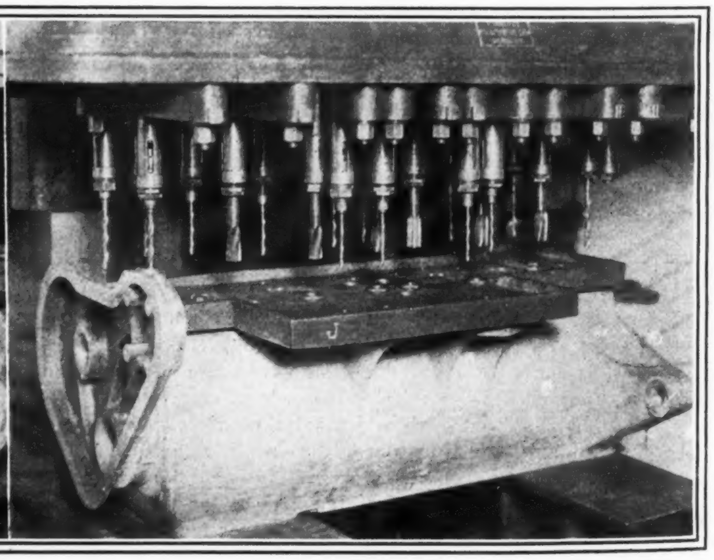
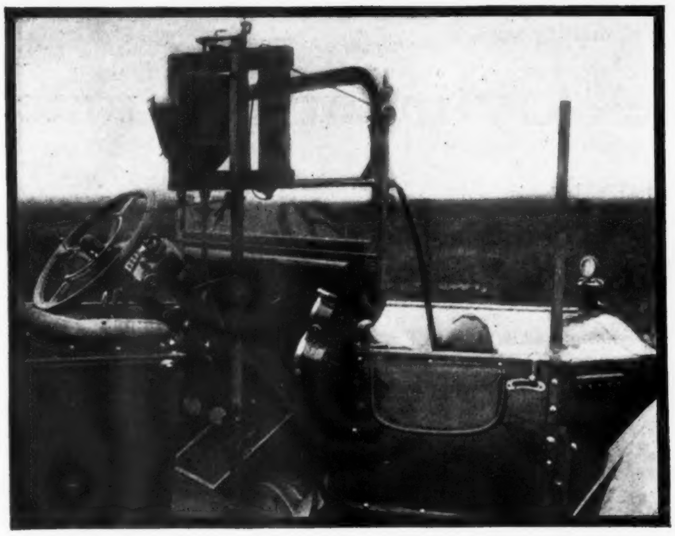


Fig. 14—Jig for drilling top of Marmon crankcase, this jig also being located from the crankshaft centers



Packard equipped with special 1-gallon gasoline tank for fuel consumption tests

A.C.A. Tests Bijur-Packard Generator

Fuel Consumption Shows That From 3 to 5 Per Cent. of Engine Power Drives Generator Fully Loaded

NEW YORK CITY, Dec. 1—In a test conducted by the Packard Co. on Long Island Parkway on Saturday it was found that the Bijur generator, on the new 38 model, consumed from 3 to 5 per cent. of the power as represented by the gasoline supplied to the engine. These figures are of great interest at the present time in that much discussion is taking place as to the real efficiency of the electric system of lighting and starting automobiles. Opponents have contended that the power absorbed in driving the generator to be so great as to render the advantages of electricity doubtful. Up to the present actual figures on this point have been scarce.

The car was driven by Frank H. Trego and the method of running the tests, which were officially observed by Herbert L. Chase, of the A. C. A., was as follows:

The car, a 2-38 Packard equipped with a Bijur 6-volt lighting and starting system and Willard 120-ampere hour battery, was fitted with a special 1-gallon gasoline tank placed conveniently for observation over the dash, and was started off from a marked point in the speedway with five passengers up. Before doing so the battery was brought to a state of low charge by running the starting motor, and consuming power by churning the engine. A sensitive ammeter was then connected to the generator so as to read the total output throughout the run.

Tire pressure readings were taken to insure accuracy, especially in regard to the front wheel from which the odometer drive was taken.

All Lamps Alight During Test

The car was then run with all lamps lighted at a constant speed of 20 miles per hour until the indicator tube at the side of the special gasoline showed that half the gallon had been used, when a return was made over the same course and the full distance reading taken as the last drop of fuel dropped from the tank.

A similar run was then made at 40 miles per hour over the same route, doubling earlier to allow for the decreased mileage at the higher speed. It was found that exactly 13 miles were run to the gallon at the lower speed and 11 miles at the higher speed. During both runs the ammeter reading was carefully noted, the average loads being 18 amperes and 15.5 amperes respectively.

Generator Replaced by Plain Shaft

The generator was then removed entirely from the car and a dummy, consisting of an aluminum frame supporting a plain shaft in ball bearings exactly similar to the generator shaft, substituted, so as to carry the drive to the magneto. Two further runs were then made with all conditions, excepting the absence of the generator, precisely the same as in the generator tests. The results were that at 20 miles per hour a distance of 13.7 miles was covered and at 40 miles per hour the car traveled 11.4 miles.

Finally, on replacing the generator a check run was made at 20 miles per hour. The result was 13.2 miles to the gallon, a sufficiently near figure to the 13 miles previously registered to show that a comparison with the no-generator tests would possess a useful degree of accuracy.

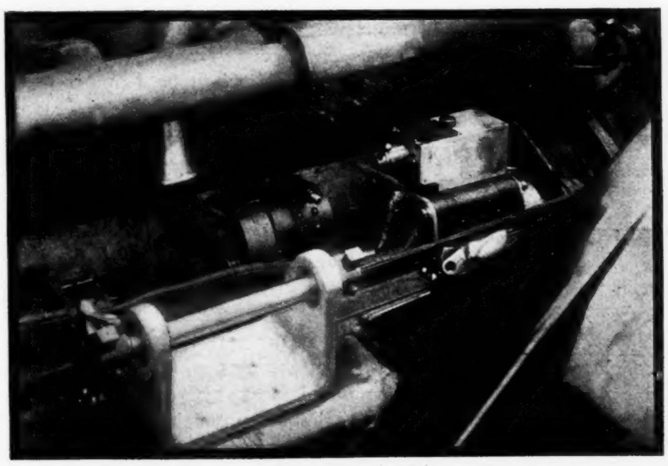
The lamps consisted of 24-candlepower tungsten headlights, 6-candlepower side lights, two rear lamps and two instrument lamps on the dash, totalling up to a load of 10 amperes. The surplus over this figure in the ammeter readings therefore indicates the amount of current passing as charge into the battery. The voltage at the generator terminals was 7 throughout, being maintained at this figure irrespective of the speed of the armature by means of a regulator of the vibrator type in conjunction with a high resistance in the field circuit.

Deducting the gallons per mile of the two sets of tests it will be found that at 20 miles per hour .004 gallon per mile represents the quantity used for driving the generator and at 40 miles per hour .003 gallon. These work out at 5.2 per cent. of the gasoline consumption at the lower speed and 3.3 per cent. at the higher speed.

Though these figures are of great interest as showing the amount of power necessary to drive the generator it should be remembered that this varies with the load, whether the lamps are lighted and the condition of the battery.

The results in tabular form appear below.

Speed, m.p.h.	Miles per gallon	Gallons per mile	Average amperes	Lamp load, amperes
WITH GENERATOR				
20.8	13	.077	18	10
20.8	13.2	.076	16.8	10
40.6	11	.091	15.5	10
WITHOUT GENERATOR				
20.2	13.7	.073	..	..
40.6	11.4	.088	..	..



Showing installation of Bijur generator on Packard 2-38. The aluminum frame in front is the "dummy" generator used in testing the engine without the generator proper

Horsepower Per Litre Cylinder Volume

Knight of Sleeve-Valve Fame Replies to Delling's Arguments On Relative Power of Sleeve-Valve and Poppet Types

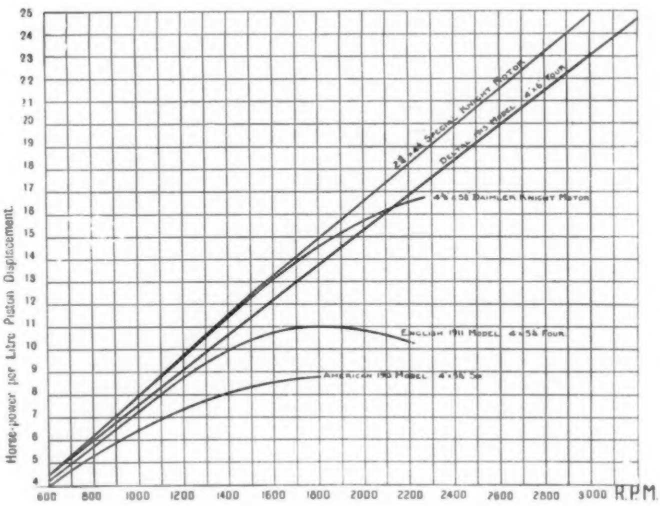
By Charles Y. Knight

EDITOR THE AUTOMOBILE:—I have read with considerable interest the valuable contribution of E. H. Delling in your issue of October 16 under the title "Light Motors Show Efficiency."

Without in any manner endeavoring to detract from the importance of this timely contribution to internal combustion engine literature, I must confess to some disappointment that one of Mr. Delling's experience and evident ability should have permitted himself to weaken his arguments by promulgating a dogma. Under the sub-heading, "Gas Supply Limits Horsepower," Mr. Delling discusses the published power curves of three motors, including his own, and says of two of them:

"One of these is the Knight sleeve-valve variety, the other an L poppet-valve six of recent design. The sleeve-valve motor should theoretically develop more power and speed than any of them owing to the extremely large port openings, but, unfortunately, it cannot realize this power and speed for other practical reasons."

To pen the above is about the most simple act imagineable. But I can scarcely believe that Mr. Delling has realized the seriousness of committing himself to a positive assertion without the fullest possible opportunity for experience and investigation. That Mr. Delling is wanting in these, so far as the sleeve-valve engine is concerned, is clear from the statements he makes. That he has committed a grievious error and has hardly been fair with either his readers or the sleeve-valve engine I believe will be quite apparent to even himself when he is more fully enlightened.



The power curves Deltal 1913 model 4 x 6 four English 1911 model 4 x 5 1/16 four and American 1913 model 4 x 5½ six are taken from Mr. Delling's chart. The other two are curves from Knight motors, one tested at the University of Bristol by Prof. Morgan, and the other in the Daimler plant in Coventry, England. All refer to horsepower per litre of piston displacement, which makes possible a basis of comparison of efficiency of various dimensions

Mr. Delling's Power Curves

In order to emphasize the efficiency of the high speed motor in which he is particularly interested, and which was specially constructed for racing purposes, Mr. Delling has employed for comparative purposes power curves from the two motors alluded to in the foregoing and a curve from his own production. The source of the origin of the sleeve-valve curve is not given. The sleeve-valve engine is stated to be a 4 by 5 1-16-inch English 1911 model. As licensors of all manufacturers of sleeve-valve engines produced in England in 1911 I must say we have no record of any 4 by 5 1-16-inch, four-cylinder motor being either produced or sold, much less any information regarding any power curve corresponding with that published by Mr. Delling. One, Prof. Riedler, of Germany, did in 1912 make a test of a 4 by 5 1-8-inch sleeve-valve motor of English design and 1911 manufacture, but the published results of his test do not correspond with Mr. Delling's power curve. And certainly Mr. Delling would not have quoted the test of such English motor because the author thereof, Prof. Riedler, in the same report in which he gives his results, calls attention to the fact that the carbureter of this particular motor showed great restriction, and gave a mixture much too rich, which resulted in low power. But this is of no great importance, and I am perfectly willing for the sake of argument to accept his curve as representing the standard touring car motor with standard carbureter, timing, etc.

At the same time it seemed to me that Mr. Delling has not been wholly fair to his own poppet-valve colleagues in exhibiting as an example of efficiency of another maker a curve of the six-cylinder 4 by 5 1-2 motor which he quotes. This, I should say from casual observation, refers to the 38-horsepower Packard engine which was tested officially by the Automobile Club of America last May, and was tuned up and adjusted, not for great power and speed, but for long endurance with the least possible chance for mechanical difficulties. Of course these two curves afforded a beautiful background and contrast for the straight line which Mr. Delling exhibited as representing the power output of the poppet-valve motor, the design for which he is responsible. But are not such comparisons somewhat misleading?

However, as I previously remarked, I fear Mr. Delling has gone a shade too far in assuming that the power curve which he attributes to the sleeve-valve, and by which he apparently limits the possibilities of this new engine design, represents the limitations of this type for efficiency. Had this curve been vouched for, it would still have been unfair as well as unsafe to assume that the record was from a specimen which an attempt had been made to develop to the limit of its efficiency, as was done in case of his special racing engine. In fact the curve at best could represent only a rather ordinary specimen of standard touring car design, with which it were wholly unfair to compare a special racing type of the poppet-valve engine.

Power per Litre Displacement

While it is true that 11-horsepower per litre of piston dislacement as shown for the alleged 1911 sleeve-valve model is not at all bad for an ordinary untuned standard touring car engine, this power being shown at a speed of 1,900 r.p.m., and is far above the power average of poppet-valve engines of that

year, yet why should such a standard motor, with cast-iron pistons weighing, as he says, from 4 to 5 pounds each, be compared with his racing engine with steel pistons the weight of which he admits has been reduced to 1 pound 11 ounces? And this is only one of the many important and essential differences between the special racing motor and the standard touring car design, with which he is comparing.

It has happened that the manufacturers who have adopted sleeve-valve engines have not found it necessary up to this time to resort to speed trials in order to popularize the new type with the public. It possesses too many other obviously attractive features to require this. But the fact remains that the sleeve-valve is today the holder of some of the most attractive records of speed and efficiency existing, and as a matter of fact when adapted to high-speed purposes have in proportion to their volume shown greater power, speed for speed, than claimed by Mr. Delling for his racing motor.

I regret that for reasons entirely foreign to the efficiency or capabilities of the motor it is impossible at this moment to produce a trustworthy reproductible record of power taken from a sleeve-valve motor at quite so high a speed as that shown for the poppet-valve Deltal by Mr. Delling, the maximum attainment of which was 24.5-horsepower per litre of piston displacement at 3,200 r.p.m. for a four-cylinder 4 by 5 type.

Horsepower at High Speeds

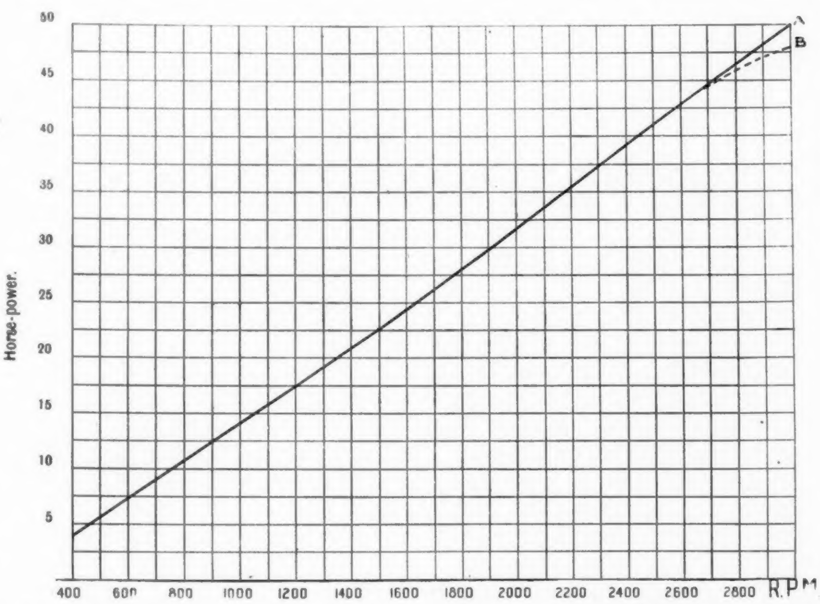
But for several months at the Daimler plant in the city of Coventry a four-cylinder 75 by 114 millimetre (2.15/16 by 4 1-2 inches) Knight sleeve-valve engine had been under accurate test at speeds up to 3,000, which is the apparent limit of this particular apparatus to register trustworthy results, the testing materials above this point showing a tendency to overheat and absorb power.

However, at 3,000 r.p.m this motor has time after time delivered 50 horsepower. Its piston displacement figures 2.016 cubic centimetres (2.016 litres) which, divided into 50 horsepower gives 24.87 horsepower litre, at 3,000, on 0.37 horsepower per litre *greater* than the power attained by the Deltal at the *higher* figure of 3,200 revolutions, as shown by Mr. Delling's own curve.

The plotted lines, however, show that speed for speed the sleeve-valve has a distinct advantage over the racing poppet-valve from the start upward. At 1,500 the poppet-valve Deltal shows 11 1-2 horsepower per litre and the sleeve-valve 12 1-2; at 2,000 the Deltal is 15 1-2 and the sleeve-valve 17; at 2,500 the Deltal is 18 and the sleeve-valve 20 1-4; and at 3,000 the sleeve-valve is 24.87 to the Deltal's 23, a clean advantage of 1.87 horsepower per litre for the sleeve-valve at this high speed, the Deltal coming up to only 24.5 at 3,200.

The Public Query

Naturally the reader inquires, "What are the differences between this 2.15/16 by 4 1-2 sleeve-valve motor, showing an efficiency of 24.87 horsepower per litre, and the motor which is supposed to have produced the 11 horsepower per litre quoted by Mr. Delling?" In the first place, quite naturally the ports have been enlarged. The standard touring car engine of this size with best carburetion would show a maximum efficiency of from 16 to 17 horsepower per litre of piston displacement. The port areas have been increased about 90 per cent. through being lengthened and deepened. It is possible so far as increased length is concerned to adopt this practice to the standard motor, but increasing the ports by deepening involves an alteration of the timing which would not give good results in everyday use. As a matter of fact, in this sleeve-valve motor arranged to give maximum power at 3,000 r.p.m. or upward the maximum torque is not attained until the speed has reached 2,300 r.p.m. The power line instead of curving forward, as is usual in diagrams from standard motors, curves slightly upward from the start and takes a straight line only from 2,300 revolutions. This is wholly due to the character of the timing.



A Knight motor of four cylinders 75 x 114 inches, with special ports and port settings tested at the Daimler plant in England, showed the above results, viz.: 50 horsepower at 3,000 revolutions per minute. The power A was not maintained for any length of time owing to heating of the testing apparatus, but B was held steadily, the difference of horsepower going into the brake

Lighter Reciprocating Parts

Naturally pistons and connecting rods have been lightened, but not to the extent attempted by Mr. Delling. Steel was not resorted to, a piston of cast iron made as light as possible to obtain with safety, and one fairly wide piston ring employed in the single groove at the top.

The curve (or line) exhibited by Mr. Deltal, representing the power of his 4 by 6 four-cylinder motor, is not to be adversely criticized. When it is realized that this represents a total of 122 horsepower for a 4-inch motor at 3,200 r.p.m. the remarkable performance may be appreciated. I assume that the tests have been accurately taken and can be substantiated should occasion require. I have heard of many tests of this character wherein wonderful results are said to have been obtained, but no official trial has ever been undertaken at such high speeds under competent observation. Personally, I should be most pleased to make a public demonstration of the ability of this sleeve-valve motor to develop 24.87 horsepower per litre of piston displacement of 3,000 if some poppet-valve manufacturer in Mr. Delling's position will furnish an official test for the poppet valve similar to the one he shows, which I do not question can be done.

Two Carbureters Add Power

But before leaving this subject I desire to call attention to the power curve from a standard four-cylinder sleeve-valve touring-car motor of 3¾ by 5⅛-inch size, manufactured by the Daimler company at as early a date as 1908. This test was made by Professor Morgan, of the University of Bristol (England), in 1912. An efficiency of 16¾ horsepower per litre of piston displacement was attained at 2,200 r.p.m. with no change from standard except in the matter of carbureters. In this two Zenith carbureters were employed, and the actual horsepower brought up to 62½. In horsepower per litre of piston displacement the showing was more than 50 per cent. better than the unidentified sleeve-valve curve shown.

Looking at the performance of the Deltal motor from the point (*Cont. on page* 1073.)

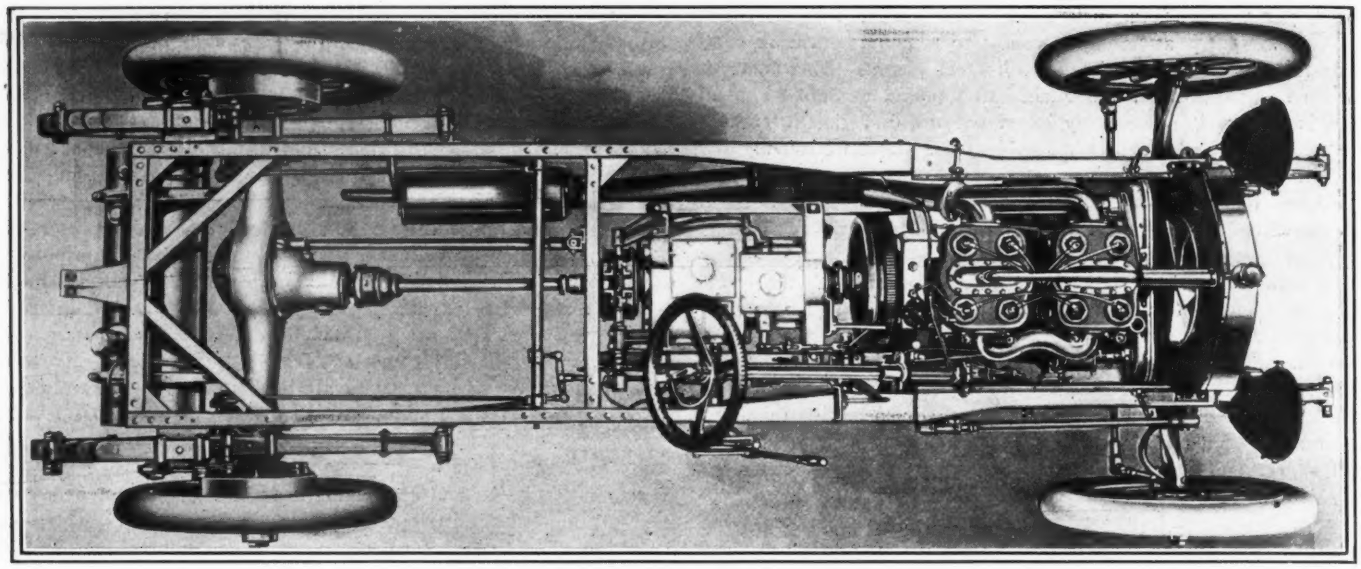


Fig. 1—Plan view of the Mercer chassis, showing the method of housing the gearset and clutch in one casting and the arrangement of the drive and torque members. The mounting of the cranking motor and the electric generator may also be noted in this view

Two New Mercers Added for 1914

Five-Passenger Touring Car and a Touring Runabout the New Features—Raceabout Is Continued—Small Roadster Model Dropped for This Season

TWO new four-cylinder models have been added to the Mercer line for the coming season. One is known as type 35, series M, and is a roomy, five-passenger touring car mounted on a chassis having a 124-inch wheelbase. The other is type 35, series O, a large runabout mounted on the 118-inch chassis which has been continued from last season. This latter model replaces the model K runabout, which was mounted on the 108-inch chassis now reserved for the well-known raceabout. Very little change has been made in the appearance of the raceabout since it was first introduced in 1910. It is a highly developed stock speed car guaranteed to make a mile in 51 seconds, and has been retained along with the five-passenger model H close-coupled touring car of last year. The raceabout is known as model J.

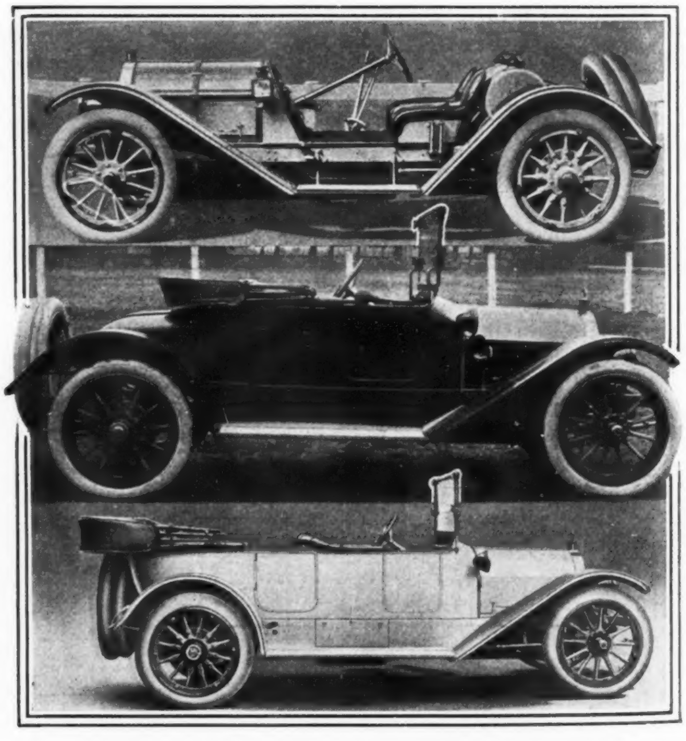


Fig. 2—Three of the body types that will be on the market this coming season. At the top may be seen the raceabout model, which remains practically unchanged since the time of its adoption, in 1910

In the center is shown the roadster that has been built with a view of being large enough to carry a touring party of two, with speed and yet with plenty of space for luggage

At the bottom is shown the new five-passenger touring car. This is mounted on a chassis having a wheelbase of 124 inches. It is considerably more roomy than the touring car of last year, which is a close-coupled design

Longer Wheelbase this Year

The only material difference in the Mercer chassis is in the length. The motor remains unchanged as far as its dimensions are concerned, although some of the processes of manufacture have been improved during the past year. One instance of this is in the pistons, where, by means of a large Le Plond heavy-duty lathe using Stellite tool steel taking a 1-inch cut, the time to turn down the piston casting has been reduced from 2 minutes and 45 seconds to 1 minute and 40 seconds. The raceabout is still fitted with a 4.375 by 5-inch motor having a S. A. E. rating of 30.6 horsepower and all the other models have a 4.5 by 5-inch motor rated at 32.4. Both types of motor must show a dynamometer pull when tested on the brake of 58 horsepower at 1,700 revolutions per minute before passing inspection. The large power rating for the moderate size motor is secured to a large extent by exceptionally large valve passages and high valve lift.

Both motors are similar throughout, except for the bore. They have four T-head cylinders cast in pairs, each subjected to two grinding processes, the final grind being after they have had time to age. The limit on this work is .001-inch. The water-jackets are cast integrally with the cylinders and are subjected to a water test before finishing.

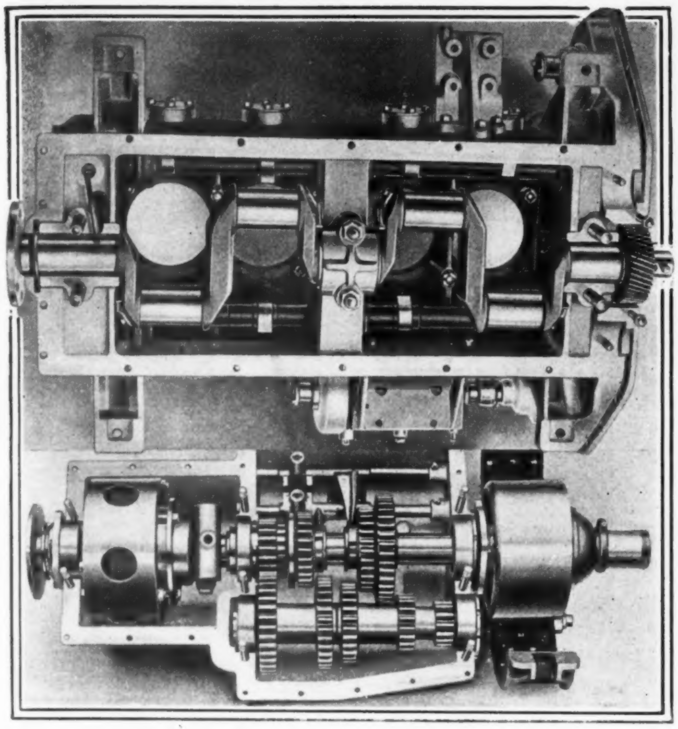


Fig. 3—Mercer crankcase and gearset. At the top is shown the upper half of the Mercer crankcase looking into it from the lower side. The crankshaft bearings, it will be seen, are supported from bridges across the crankcase and the main bearing caps are held in place by two bolts. These are nickel steel and are locked by French locks consisting of a strip of metal passing over two adjacent bolts and bent up around the nuts. The lower part of this view shows the gearset and clutch, which are contained in the same housing. The clutch has forty-four steel disks, which run in oil and which are concave. The gearset has four speeds, and the shafts each have four splines

The valves are on opposite sides of the motor, the intake on the right and the exhaust on the left. They are generous in size, being 2.25 inches in diameter, and have a lift of .4375 inches. The material from which the valves are made is Tungsten steel. This material is used owing to its hardness and because exceptional strength against warping is needed on a valve of this diameter. The valve stem passes through the cylinder in an inserted bushing and between the cam and the valve lifter an intermediate arm having a pivoted bearing prevents any side thrusts that might be caused by the cam in lifting the valve. This construction is used in the Mercer motor because an exceedingly steep cam is used to secure a quick valve opening in order to get the maximum charge in the cylinders in the shortest time. This is a factor in the high horsepower developed by this moderate-sized motor.

Use Two Piston Rings

The pistons used in the Mercer car differ from conventional practice in that but two rings are used and these are placed as near the top as possible. The rings are 1-4 inch in width and the top one is 3-16 inch from the top of the piston, and the second is 1-4 inch below the top ring. Instead of being eccentric they are turned the same thickness all the way around, and are peened in a special machine which gives them an even tension throughout the entire circumference. The wristpins are hollow, of alloyed steel hardened and ground. They are clamped in the upper ends of the connecting-rods and oscillate in the piston bosses, which are not bushed, the cast iron of the piston acting as the bearing metal. The pistons are 5.75 inches in length and have a clearance of .02 inch down as far as the top ring and below that a clearance of .008 inch to the bottom. This clearance shows that the Mercer motor is designed to be efficient at high running speeds. Particular attention is taken to see that all sets of pistons and connecting-rods are of the same weight.

The connecting-rods are of H-section drop forged from steel of 3.5 per cent. nickel and 40 point carbon. The H-section is turned opposite to that generally used and the extra wide flanges give stiffness against bending stresses. The connecting-rods have a total length of 12.5 inches from center to center and, the cylinders not being offset, give an unusual lack of vibration at high speeds, owing to the reduction of angularity. The lower end of the connecting-rod is split and the bearing caps are retained by four 3.5 per cent. nickel-steel bolts fastened by French locks. The French locks consist of thin strips of metal punched to pass over two adjoining bolts and then when the nuts are screwed down tightly the metal is bent up around them, thus holding them in place. The bearings are of Parsons white metal with bronze backs.

Nickel Steel Crankshaft

The 2-inch crankshaft is a drop forging from heat-treated steel of 3.5 per cent. nickel and 40 point carbon. The tensile strength is 160,000 pounds. It is provided with three large Parsons metal main bearings, the lengths being 3.5 inches front, 3 inches center and 4 inches rear. The crankshaft is anchored by bolts to the upper section of the crankcase and each shaft is

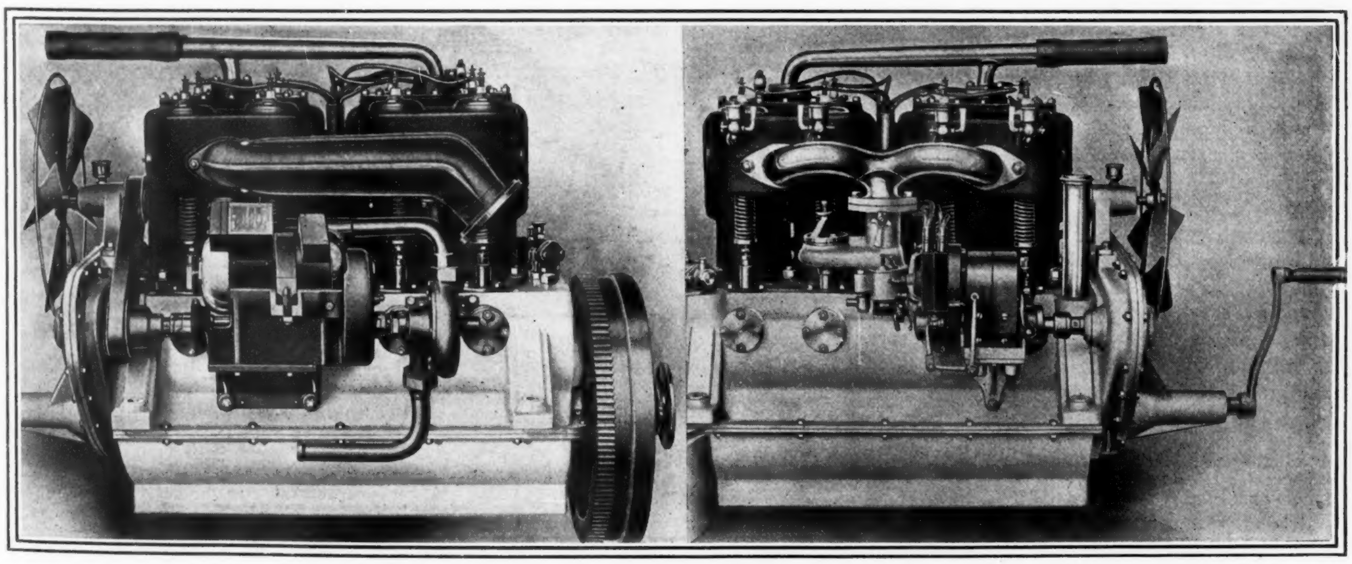


Fig. 4—A view of each side of the Mercer 4.5 by 5-inch motor, which is required to show a dynamometer pull of over 58 horsepower at 1700 revolutions per minute. The mounting of the generator on one side and the magneto on the other may be noted

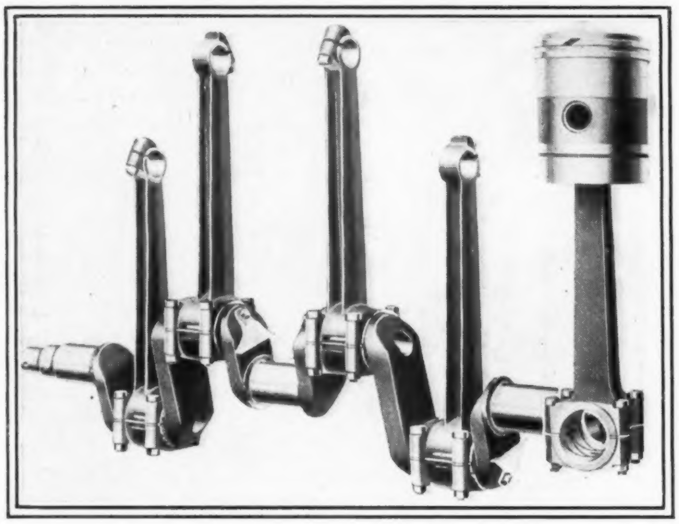


Fig. 5—The Mercer crankshaft, connecting rods and pistons are shown here at a glance. The crankshaft has three main bearings and is of 3.5 per cent. nickel steel drop-forged. The connecting rods are noteworthy for the fact that they are turned in the opposite direction to what is common practice. The bending movement on these is taken through the depth of the H-section flanges instead of transversely. The piston is also worthy of special attention, in that but two rings are used and they are put as near the top as possible. The clearance used on these pistons is remarkable, in that it is .02 inch between the top ring and the top of the piston and .008 below that. This is about double the ordinary practice

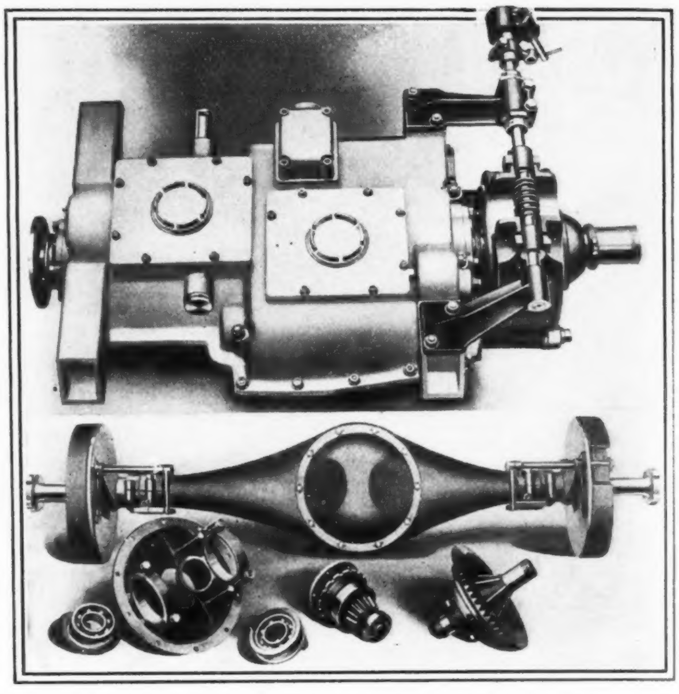


Fig. 6—This shows the housing for the clutch, gearset and rear axle. The clutch and gearbox housing are commendable for the large cover plates that are provided, thus allowing an opening that will permit of the hand passing readily into the gearbox. The rear axle and differential housing is a unit and is of pressed steel. A partial disassembly showing some of the bearings is given

tested for running balance on a Norton instrument at a speed of 1,800 revolutions per minute.

The camshafts are of low carbon steel, 20 point carbon being the material used here. The cams are integral with the shaft and the diameter of the latter is 1.25 inches. The cams are ground to gauge and have their surfaces case-hardened. A novel arrangement of bearings which insures accuracy and at the same time easy running is used on the Mercer camshafts. The front bearing on each shaft is of the annular ball type, while the center and rear bearings are plain. The center bearing is 1 17-16 by 3 inches, and the rear bearing is 1 7-16 by 1.5 inches. This construction gives a fixed point for the front bearing and renders alignment a simple matter. The shafts are driven by bronze spiral gears having a face width of 1.25 inches. These gears mesh with steel gears attached to the crankshaft and to the pump and magneto shaft.

An aluminum alloy crankcase is used, divided at the main bearing line. The lower section carries the oil reservoir in its base and the upper section furnishes the bearing support.

The lubricating system is a combination of pressure feed and splash. The oil is circulated by a gear-driven, force-feed rotary pump which takes the oil from the reservoir and forces it through a sight feed on the dash. From there it is carried back to the center of the crankcase. The oil which overflows from the main bearings is picked up by pockets on the crankshaft and thrown by centrifugal force to the cranks. All the crankshaft bearings are positively taken care of while the cylinders, camshaft bearings and timing gears are lubricated from the splash. A constant level is maintained by overflow dams located in the crankcase between the cylinders. Vents arranged at a correct level in the overflow dam permit all the surplus oil to be returned to the reservoir. An oil indicator, comprising a small cork float attached to a calibrated rod, shows the amount of oil in the crankcase at any time. The oil capacity is 1.75 gallons.

Pressure-Feed Fuel System

The gasoline system is composed of a pressure feed outfit on models H, M and O, and on the J, or raceabout, it is a gravity feed. A Flechter carbureter specially designed for Mercer needs is used on all models. On the cars using the pressure feed systems the gasoline tank is swung from the rear of the chassis frame. The air pressure is maintained by means of a reciprocating pump with a trunk piston having no rings. The air pump is driven by the same gear that drives the oil pump and feeds the gasoline under a pressure of 2 pounds' excess pressure escaping through a relief valve. The initial pressure for starting the car is furnished by a hand pump. The carbureter size is 1.75 inches. It is equipped with a hot air tube for taking the heated air from around the exhaust pipe. On the new models it is also fitted with an air adjustment that is controlled from the quadrant on the steering wheel. The piece carrying the spark and throttle levers has now been extended around to take in both sides of the wheel.

Rushman Lighting and Cranking

Electric equipment on the Mercer H, M and O cars consists of a complete Rushmore lighting and cranking system and a Bosch two-point ignition system. On the model J raceabout there is no electric equipment other than the ignition. The electric lighting and cranking system employed on models H, M and O consists of a generator, cranking motor and a Witherbee storage battery of 120 ampere hour capacity. The entire system operates at 6 volts. The cranking motor, which is mounted on the inside of the subframe just behind the engine, is arranged to drive directly through the flywheel by means of gear teeth cut in the casting. The reduction between the cranking motor and the engine is 5 to 1 and the cranking motor is rated at 1.25 horsepower. It is capable of spinning the engine at 160 revolutions per minute under ordinary circumstances. This speed is sufficient to start the motor on the magneto and for that reason no battery ignition is used. The storage battery, therefore, has no ignition duties, only supplying current for cranking and for the lights when the car is not in motion and when the current is not being furnished by the dynamo. The battery, which weighs 70 pounds, is mounted beneath the tonneau floorboards in models M, H and O. Model J, the raceabout, has no battery, but carries an acetylene tank. The generator cuts out when the car stops and starts charging immediately after the engine is started. The gear ratio between the generator and the crankshaft is 3 to 1.

The ignition system is by ZR-4 independent two-spark Bosch magneto located on the intake side of the motor. Two sets of plugs are utilized, one over the intake and the other over the exhaust valves, with both fired simultaneously. Control is by a two-point switch permitting the use of one or both sets of plugs if desired.

An improvement which has been made in the cooling system is in the water manifold, which is of deposited copper, 1-16 of an inch thick. This copper manifold is manufactured by having it deposited on a wax core. The radiator is cellular and is supported on the main frame by ball and socket joints. The water circulation is maintained by a gear-driven centrifugal pump which delivers the water directly under the exhaust valve. The direction the water takes is from the exhaust to the intake side. The pump, electric generator and fan pulley are all operated by the same shaft system and are carried on ball bearings. A special coupling connects the extension of the generator shaft with the pump shaft.

Multiple-Disk Clutch Used

The power is transmitted by means of a multiple-disk clutch running in oil. The clutch has forty-four steel-to-steel plates, and is engaged by a single helical spring. The clutch plates are concave at a 22-degree angle, which results in a soft but positive engagement. The clutch housing is integral with the gearbox which houses the four-speed selective sliding gearset with direct drive on fourth. This part of the transmission is suspended in the subframe in such a manner that by taking out the bolts which hold the two parts of the gearbox together, the lower half may be removed without in any way disturbing the alignment of the gearset. Carpenter's chrome nickel steel splined shafts are used in the gearset, and these are mounted on annular ball bearings. The gear reductions on the different models are as follows:

Speed	M	O	H	J
First	9 to 1	9 to 1	9 to 1	7 to 1
Second	5 to 1	5 to 1	5 to 1	4.5 to 1
Third	3.82 to 1	3.75 to 1	3.75 to 1	3.5 to 1
Fourth (direct)...........	2.82 to 1	2.82 to 1	2.82 to 1	2.52 to 1

The driveshaft is of 3.5 per cent. nickel steel having at each end a Spicer universal joint. A floating rear axle is used, the driveshaft being of 3.5 per cent. nickel with integral jaw clutches. The differential and axle housing is of pressed steel and the gears are accessible by removing a large inspection plate at the rear. The wheel thrust is transmitted to the chassis through two-radius rods, allowing the springs to be shackled at both ends. A triangular torsion bar composed of 3.5 per cent. nickel steel tubing and mounted between heavy helical springs which are suspended from a cross member in the frame, absorbs all torsional strains. The front axle is a one-piece 3.5 per cent. nickel steel forging of I-beam section. The front wheels and steering spindles are mounted on annular ball bearings.

The frame is of channel section 4.5 inches deep and of 5-32-inch stock. It is narrow in front, providing a turning radius of 22 feet on the H, M and O models. At the rear the frame has a drop of 3.5 inches. The springs on models H, M and O are semi-elliptic front and three-quarter rear, while on model J, the raceabout, they are semi-elliptic both front and rear. Silico-manganese is used in all the springs and on the larger models, the front springs being 36 inches long by 2.25 inches wide, and the rear 48 inches long by 2.5 inches wide. On the raceabout the spring lengths are the same, but the width is 2 inches. On all models Traffault-Hartford shock absorbers are fitted all around.

Two sets of brakes are provided, the service brake being an 8-by-4-inch contracting type, operated on the transmission and adjustable by means of a three-pitch right and left handed nut. The emergency brake is an internal expanding of 14 by 2 inches operating on a rear wheel drum. Model H and O are fitted with 34 by 4-inch tires all around and model J carries 32 by 4-inch. On model M, 34 by 4-inch tires are used on the front and 35 by 4.5 on the rear wheels. Quick detachable rims are stock on all models.

The body designs of the five-passenger models and runabout are attractive and are noticeable for their straight lines and deep upholstery. The seats are 22 inches from front to rear, cushions are 9 inches thick, sloping to the rear with a depth of 4.5 inches at this point. Model M has a 49-inch rear seat and model H a 44-inch. Deep coil springs are used in the backs of the seats and the lower parts of the cushions. The equipment is very complete, including top, windshield, a full set of dash instruments mounted on an instrument board, etc. The lamps provided are two 25-candlepower headlights, two 6-candlepower side lights and a 3-candlepower tail and dash light in series. On the raceabout the headlights are gas and the side and tail oil lamps.

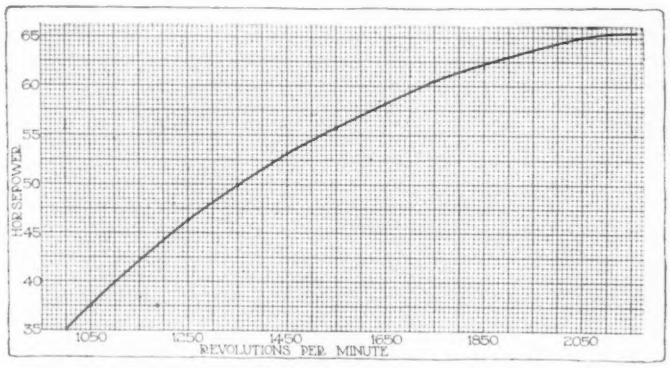
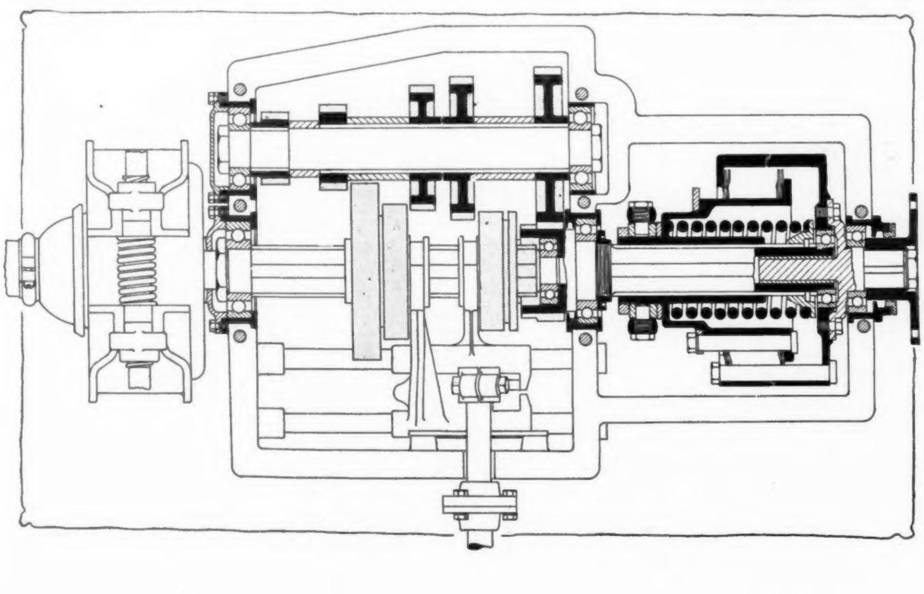


Fig. 7—Curve of horsepower of the Mercer motors. This is the power developed by several motors taken in a composite diagram and thus represents a true average of a series of motors tested on the dynamometer



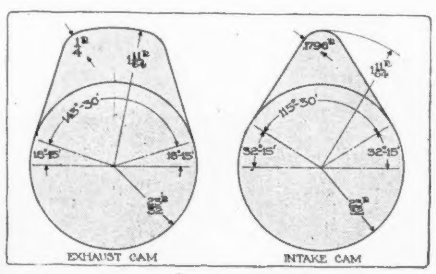
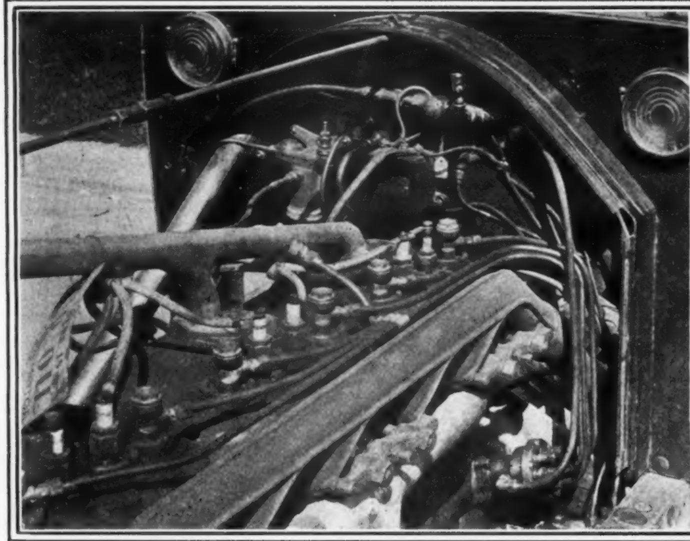
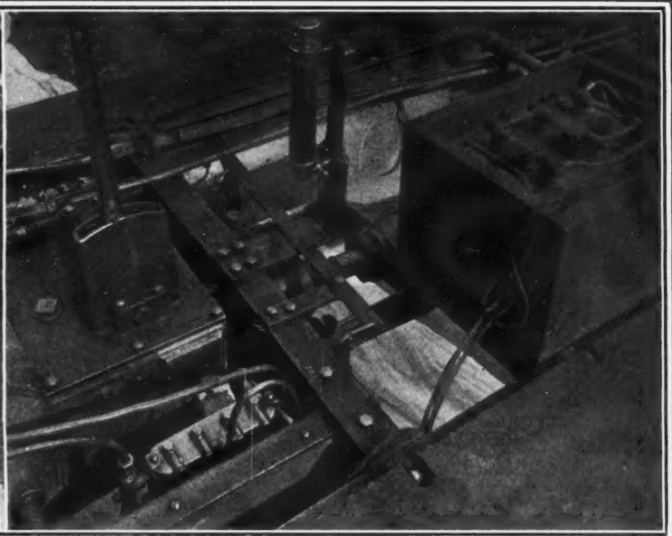


Fig. 8—Cam contours of the Mercer motor. These are a potent factor in producing the exceptional power and speed output of these engines.

Fig. 9—Sectional view of the clutch and gearset, showing the arrangement of the clutch plates and spring and the mounting of the gears





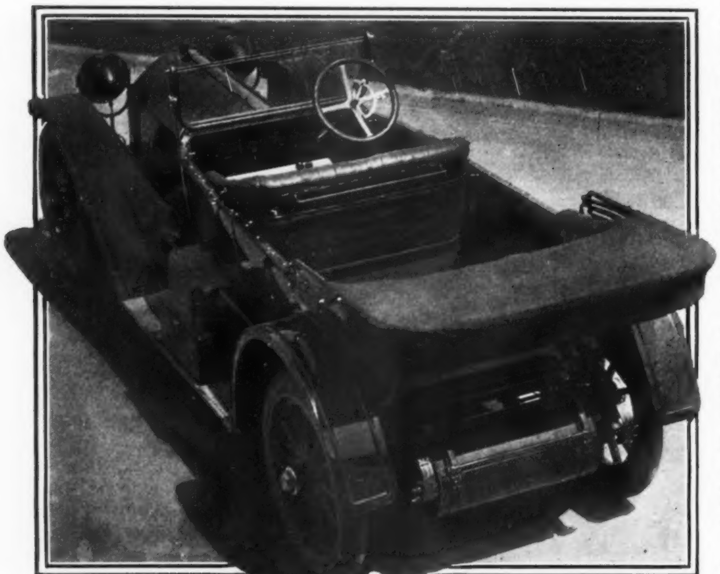
Top view of motor, showing wiring arrangement. View of control mechanism and battery mounting

DeSoto Car Embodies Light Six Motor

Has Electric Cranking and 132-Inch Wheelbase, $2,185

ANOTHER six which is close to the $2,000 mark is the De Soto. This car, selling at $2,185, embodies some of the latest features in motor car design. It is electrically lighted and has an air starting system. This car is equipped with either two, four, five or seven-passenger bodies. It weighs 3,500 pounds, and has a wheelbase of 132 inches.

The motor used in this car is the Beaver six. It has a bore of 4 inches and a stroke of 5 inches. The cylinders are cast in pairs with integral waterjackets. This motor develops, according to the manufacturers, a nominal horsepower of from 50 to 55. The pistons are long and are balanced by weighing before assembly. At the lower end they are provided with oil grooves, through which holes are drilled to prevent an oversupply of oil being sucked into the combustion chamber. The excess oil escapes back to the crankcase. The pistons have three rings, all of which are located above the wristpin. The wristpins are clamped to the pistons, and bushings of bronze are pressed into the upper end of the connecting-rod.



Complete De Soto five-passenger touring car

The connecting-rods are of I-beam section and are drop-forgings. They are heat treated. The connecting-rod bearings are secured by nickel steel bolts which hold the bearing caps over the crank and bearings. Adjustments on these bearings can be made by removing the fine shims placed between the bearing caps and the bearing support.

The crankshaft is 1.6875 inches in diameter and is carried on four main bearings, lined with Parson's white bronze. These bearings measure in length as follows: Front 3.5 inches, first center 3 inches, second center 3 inches, and rear 4 inches. This gives the total length of 13.5 inches for the main bearing, while the connecting-rod bearings are each 2.625 inches in length.

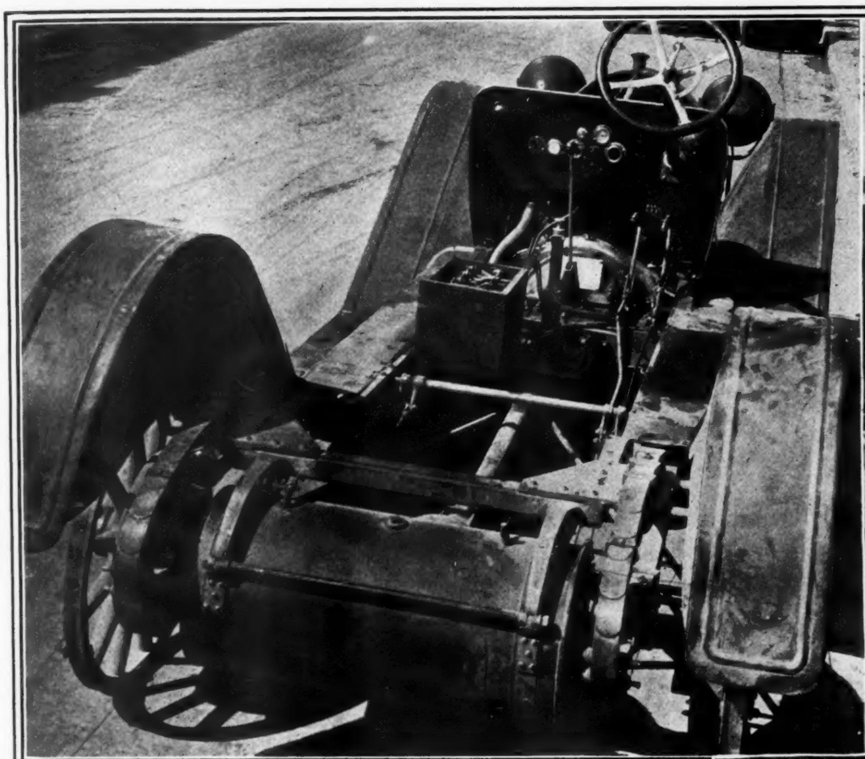
The valve action is driven by all-steel gears of helical type, inclosed in a dustproofed, oiltight case in front of the motor. These gears run in oil and have a tooth breadth of 1.125 inches. The drive is transmitted to a camshaft having the cams cut integrally with it. This camshaft is hardened and ground and is carried on four Parson's white metal bearings. The valves are of nickel steel and operate in a dustproof casing, which can be removed by simply turning a wing nut. The diameter of the valve is 1.875 inches and the lift is .375 inch. The method of communicating the motion from the camshaft to the valves is by means of a direct roller follower carried in the bottom of the valve lifter.

The gasoline system consists of a pressure gasoline tank of pressed steel which feeds the fuel to a Schebler carbureter. The gasoline tank is attached to the rear of the frame with heavy brackets. These brackets are hinged to permit of ready removal of the tank if desired. The plug for draining is located at the bottom of the tank. The pressure within the tank is automatically regulated, the air being pumped by the motor. A handpump is provided for use after the car has been standing for some time, and an air gauge on the dash indicates the air pressure in the tank at any time. The tank has a capacity of 20 gallons. A hot air attachment is used in connection with the carbureter which takes the air from around the exhaust pipe, thus aiding vaporization.

Combination Force Feed and Splash Oiling

The oiling system is a combination force feed and splash. The oil reservoir is located in the lower part of the crankcase. A gear pump lifts the oil from the reservoir and carries it to a sight feed on the dash. From this point the oil flows back through a lead to the bearings in the crankcase and constantly flows over the main bearings and timing gears. Below each connecting-rod throw there is a hollow trough which speedily becomes filled with lubricating oil. As the connecting-rod sweeps around this oil is splashed to the interiors of the cylinders, to the camshaft bearings, and in fact creates a mist which pervades the entire interior of the motor.

The electric equipment of the car consists of an ignition and lighting system. The ignition for running is provided by a Remy magneto, while for starting there is a set of dry batteries. This provides a complete dual system of ignition. The lighting



Quartering rear view of De Soto chassis, showing arrangement of rear

system comprises a generator and a 120-ampere-hour Willard storage battery.

A multiple-disk clutch takes the power from the motor and transmits it to the gearset. The clutch is inclosed entirely in the flywheel housing and runs in oil.

The gearbox contains a three-speed selective gearset and is bolted directly to the motor crankshaft, giving a unit power plant. The gearset shafts are carried on German Hess-Bright ball bearings.

Propeller Shaft Is Inclosed

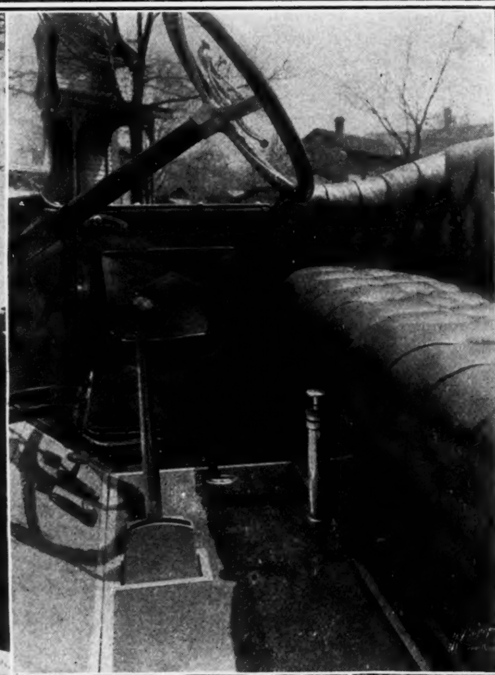
From the gearset the power is delivered through an inclosed propeller shaft. This shaft is 1.5 inches in diameter and is composed of heat-treated nickel steel. The forward end is attached to the gearbox through a large universal joint, the sliding square of which measures 5 inches in length and 1.125 inches across the face. The weight of the shaft is removed from the universal joint by means of a yoke arranged to slip on the housing of the propeller shaft and made fast to the cross-member of the frame at this point.

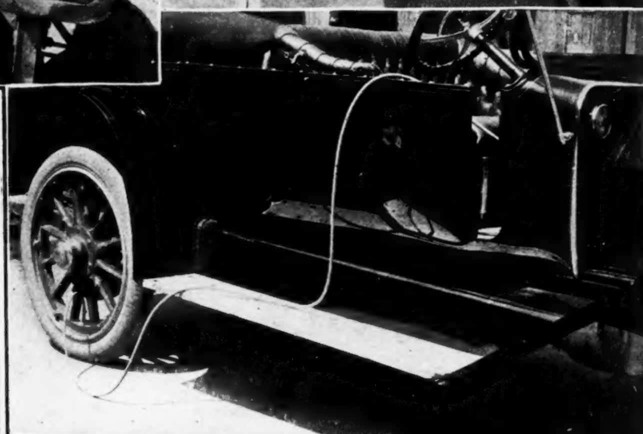
The rear axle is the floating type with bevel gears. The driving gears and differential are mounted in a unit and can be removed from the axle without taking it apart. The bearings are of the annular type, the whole system running in oil. The axle shafts are 3.5 per cent. nickel steel and 1.5 inches in diameter. The axle drive of the car is transmitted to these driveshafts by four large steel lugs which fit into corresponding slots of the wheel. Outside of the torque rod feature the rear axle is braced and supported by diagonal radius rods.

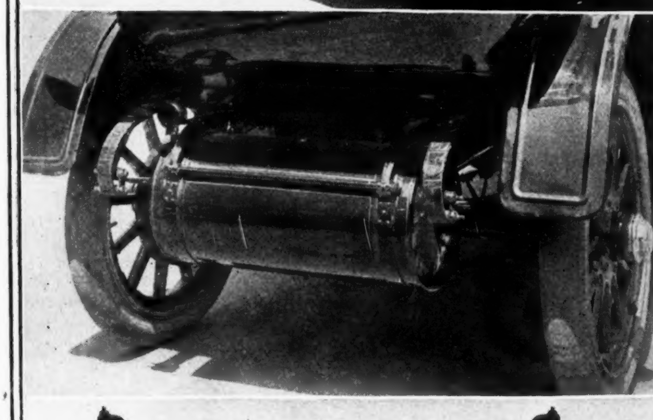
Both sets of brakes are carried on the rear wheels. The drums are respectively 16 and 20 inches in diameter and each have a face width of 2 inches. The service brake is interconnected with the clutch. The brakes are lined with Raybestos.

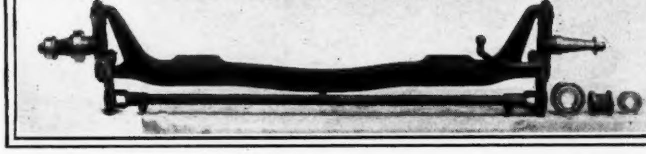
The frame construction is novel in that for half its length at the forward end it consists of a double frame which is really a frame within the main frame. The subframe furnishes the three points for the motor frame, while the main frame consists of a channel beam, which is over 4 inches deep and 2.5 inches wide. The thickness of stock is 3-16 inch. The main frame is reinforced by broad and heavy gusset plates which are hot riveted across the corners at the rear of the frame. The frame is double dropped, considerably lowering the center of gravity of the entire car.

The front springs are 40 inches long and 2 inches wide. The rear springs are 48 inches long and 2 inches wide. The front wheels are the same size as the rear and are designed for 36 by 4-inch tires. All the wheels are equipped with Firestone demountable rims.







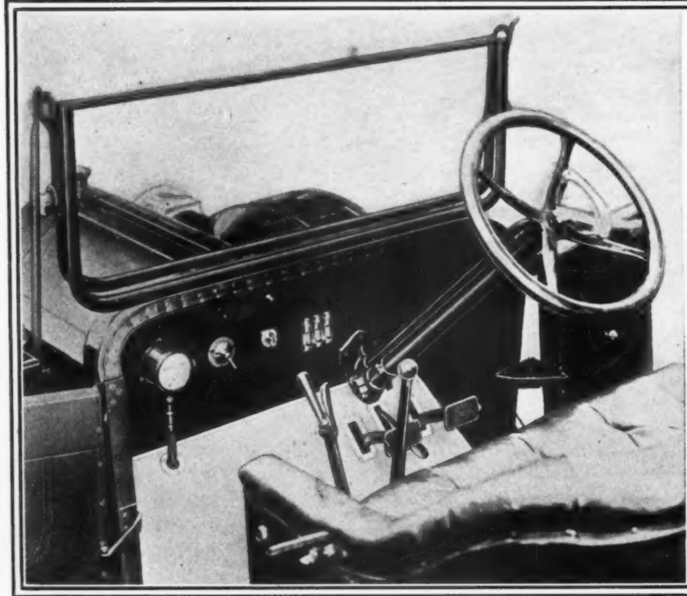


Top—Gearshifting lever and hand-pressure pump to fuel tank. Note undivided driver's seat

Center—Side view of car, showing tire inflation tube mounted for action

Lower—Mounting of the pressure tank at the rear of the chassis. Note protecting bar

Bottom—Solid I-beam forging and assembly of front axle



Control features, windshield, dash fittings and sight feed oiler on 1914 Empire

To the Right—Driver's seat of the new Empire. Note the deep upholstery used and the undivided back

New Empire Has Full Equipment

1914 Car Is a Refined and Enlarged Edition of 1913 Model—Price Lowered to $900

THIS year's model 31 is a refinement and an enlarged edition of the model 31 Empire brought out for the 1913 season. There are no radical changes in the basic principles and design of the 1914 Empire as compared with the car put on the market for 1913, the most important change being a cut of $50 in the price, which now becomes $900. This cut in price coupled with the fact that complete equipment is furnished and the fitting, finish and body design is more elaborate than last year marks a bigger change in price than is really represented by the $50 alone.

The minor changes which will be found in the chassis are not of much importance with the exception perhaps of a lengthened wheelbase. This dimension is now 110 inches, whereas last year it was 104 inches. In the general design the makers have made a point of simplicity and accessiblity.

Unit Plant—Three-Point Suspension

The power plant is in a single unit including the engine, clutch and gearset. This unit is suspended from the frame at three points, forming an equalateral triangle, the apex of which is a flexible support consisting of a pivot. Distortions of the frame do not affect the motor structure as the third point of suspension acts as a swivel and neutralizes the strains.

The motor has four watercooled cylinders of the L-head type cast in pairs. The material used in the casting work is gray iron and it is bored, machined and then in the manufacturing work allowed to age before the final reaming and boring work in order to eliminate internal casting strain. The valves are carried up the left side of the motor and are so arranged that the pockets in which they are carried can be reached easily.

The bore of the motor is 3.75 inches and the stroke 4.5 inches. This gives a piston displacement of 198.8 cubic inches and a stroke bore ratio of 1.2.

The crankshaft of the motor is a drop-forging of high carbon steel. It is 1.75 inches in diameter, ground to size, and carried in three main bearings which are respectively 3.3 and 4 inches in length from front to rear. The bearings are lined with white brass. The diameter of the crankshaft bearings are respectively 1.5, 1.5 and 1.625 inches.

High Carbon Steel Camshaft

The valve action is driven from timing gears of large diameter. The camshaft is of high carbon steel carrying the cams integral. It is carried on four bearings. Fiber inserts are used on the valve tappets and the entire external valve action such as the stems, springs, tappets, etc., are housed by cover plates which can be quickly removed. The valve diameter used throughout is 1.625 inches and the lift .3125 inches. The material used in the valves is nickel steel for the stems and cast iron for the head.

The oiling system used on the Empire car is a combination of the force feed and splash. The oil is carried in the lower part of the crankcase which has a capacity of 1.5 gallons. A positively driven pump takes the oil from the bottom of the crankcase and forces it through a sight feed located on the dash before the eyes of the driver. The entire oil supply passes through this sight feed and from that point flows to the three main bearings which are thus lubricated. After overflowing from the main bearings the oil passes into troughs in the crankcase into which the ends of the connecting-rods dip, throwing an oil spray to all the working parts of the motor. The oil in these troughs overflows when the level becomes of a certain height so that the scoops on the connecting-rods cannot dip too deeply into the oil supply. After overflowing, the oil again passes to the reservoir.

Ignition current is furnished by an Eisemann high-tension magneto carried on the left side of the motor and driven through the timing gears. The spark is fixed, compensation for high motor speeds being afforded inherently by the magneto, which supplies a fatter and hotter spark as the speed of the armature increases. There is no spark lever located on the steering column with this system. The wiring plan used is simple. There are but four short cables to the spark-plugs and a single lead to the switch located on the dash. The wires leading to the dash switch are a low-tension scheme which short circuits the mag-

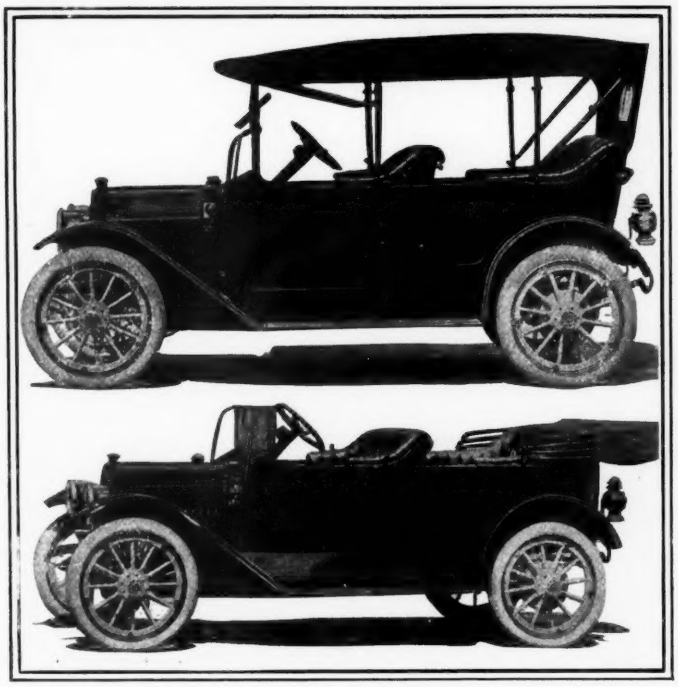
neto when the switch is closed. The running position of the magneto is an open switch. The high-tension wires are clipped in a fiber holder attached to a metal plate bolted to the stirrups retaining the intake and exhaust manifold.

Thermo-syphon cooling is used. The water enters the cylinders at the right side of the motor, passing upward through the waterjackets and around the exhaust valve and thence to the outlet manifold at the top of the cylinders to the radiator. Both water manifolds are of polished aluminum and have an inside diameter of 1.75 inches. Cooling is further aided by a large belt-driven fan supported on ball bearings.

A model H Holley carbureter located on the left side of the motor takes care of carburetion. A special air adjusting device is fitted which is controlled by a dash lever. This enables the driver to vary the mixture at will without leaving the seat. Quick vaporization is helped by taking heated air from the neighborhood of the exhaust through a flexible tube to the air intake. The gasoline reaches the carbureter by gravity flow, the tank being carried under the seat. It has a capacity of 15 gallons with a reserve of 2 gallons.

A clutch used in the Empire chassis is of the disk and ring type. It has three 9 inch disks, two of which are faced with Raybestos and the third running between them is of steel. The entire clutch is housed within the unit plant and runs in oil. The clutch may be reached, however, for adjustment and inspection by removing a large hand hole cover fitted to the top of the clutch housing. The hand hole cover may be reached by lifting the floor board in the driver's compartment.

The gearset is a selective type having three forward speeds and one reverse. The gears have .875 inch faces and may be reached through a cover plate which is fastened over the gearset housing. This cover provides an opening for renewing the lubricant and can be reached by lifting the front floor boards. The ratio between the motor and the rear wheels is 4 to 1 on third or direct drive.



In the upper part of the illustration is shown an enlarged view of the new Empire, model 31, with the top and windshield raised. Below is the same car with top back and windshield partly lowered

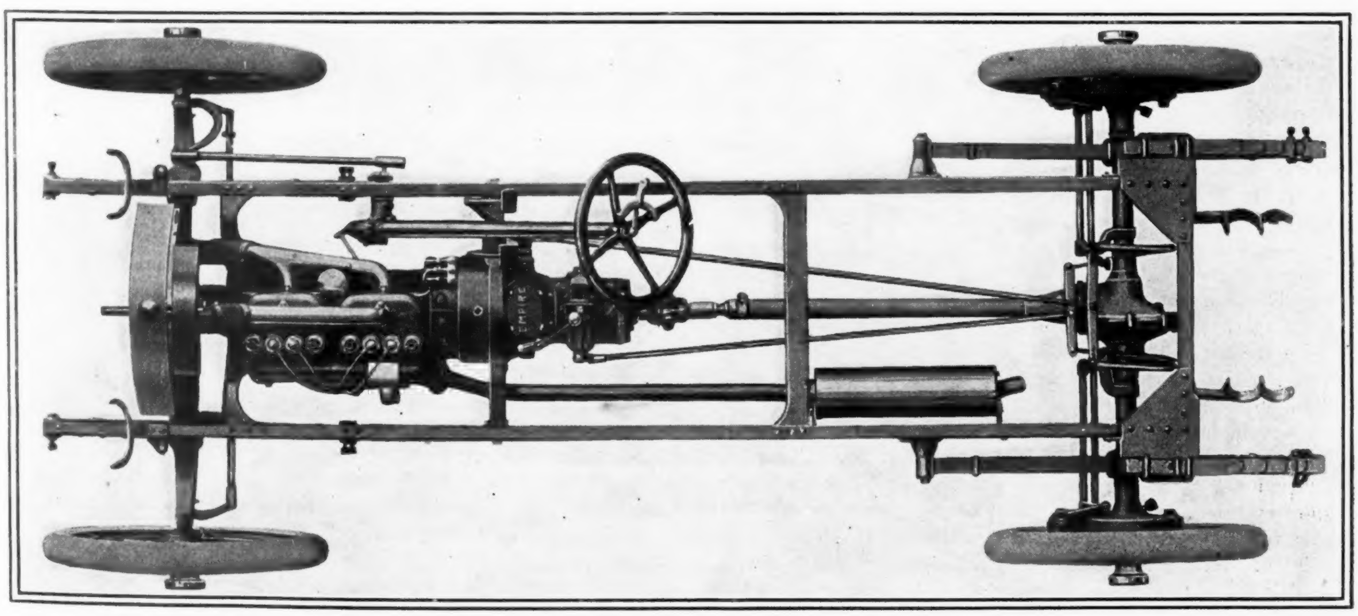
One Universal

The only universal joint in the drive system is located at the rear of the gearbox. The drive is taken through a large steel shaft inclosed in a tube reinforced at the universal joint. The shaft is squared at the universal joint end and takes the drive through this end. It may be quickly removed along with the rest of the rear system by removing the rear axle spring clips and detaching the brake rod.

The rear system consists mainly in the semi-floating Weston Mott rear axle. These axles are of heat treated steel carried on heavy duty Hyatt roller bearings throughout.

A noticeable feature of the axle housing is the utilization of a 3.5 inch sleeve bearing member which is hardened and ground. The axle carries a hardened sleeve and the rollers bear upon these members.

The brakes are carried on the rear wheels and have a drum diameter of 12.5 inches. The wheels are of the artillery type with second growth hickory spokes and they are fitted with Baker demountable rims adapted to 32 by 3-5-inch tires both front and rear. One extra rim is supplied as standard and provision is made for carrying two extra rims at the rear of the chassis. The tire holder is anchored to the rear cross-member, giving a firm support and at the same time keeping the running boards free and clear.



Plan view of the 1914 Empire chassis, giving an excellent idea of the strong but simple construction employed, the unit power plant, right drive with center control and tire carriers at the rear of the reinforced frame

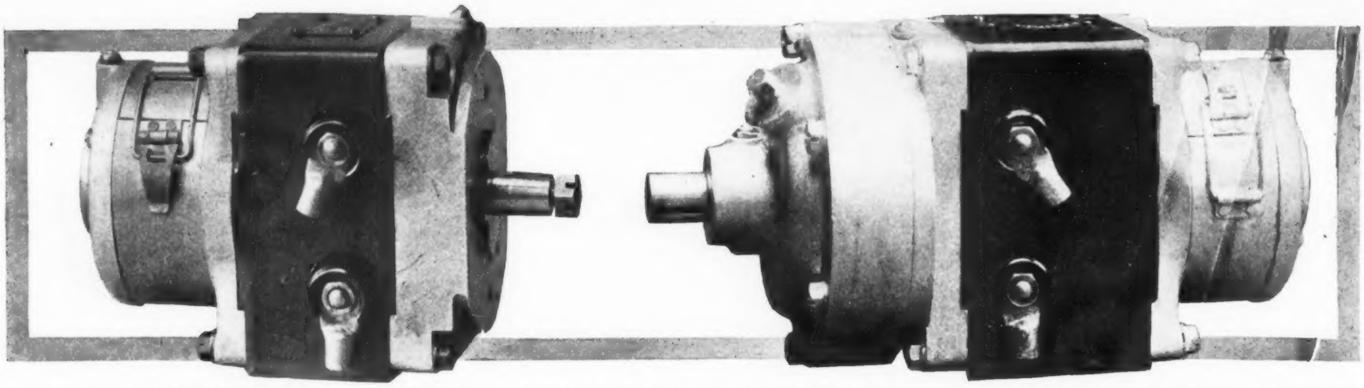


Fig. 1—Smallest Westinghouse starting motor for flywheel drive. Fig. 2—Westinghouse starter with inclosed reduction gear for chain drive

Westinghouse Starter a Compact Design

Smallest Model for Flywheel Connection Weighs Only 18 Pounds—Made With or Without Internal Reduction Gear

CONSIDERABLE difference of opinion still exists as to which is the ideal position and method of connecting the electric starting motor to the automobile engine. The flywheel type of starter is perhaps showing the most decided gain in popularity but there are still many engineers who prefer the front end drive to the crankshaft or the third method of applying the motor to the transmission. Individual peculiarities of engine design are the chief determining factors at present, since it is necessary for the car builder to adapt an already designed motor to his engine.

But whether on account of engine design or the particular choice of the automobile engineer it behooves the manufacturer of electric, or other starting devices for that matter, to furnish his equipments with as wide a range of adaptability as possible if he has an eye on a large market, particularly now, to suit the smaller companies.

To meet the requirements of the two principal methods of applying starters the Westinghouse Elec. & Mfg. Co. has designed the motors shown in Figs. 1 and 2. That to the left is a compact rectangular model for connecting to the flywheel through a gear reduction and a sliding pinion. The other model contains an internal reduction gear of about 9.5 to 1 within the aluminum alloy endcover providing a speed at the extension that is suitable for drive by chain to the crankshaft. From the electrical point of view there is practically no difference between the two models. The first has a plain endcover containing a ball bearing for the armature shaft while in the other a cylindrical casing carrying the reduction gear is inserted between the magnet frame and the end bearing.

Westinghouse Starting Motor Features

Four-Pole one-piece rectangular steel frame—Aluminum alloy endcovers—Ball Bearings—Series fields with coils on two poles only—Made in two types—three sizes to each type: 1, With inclosed reduction gear for chain drive to crankshaft. 2, Without gear for application by car builder to flywheel

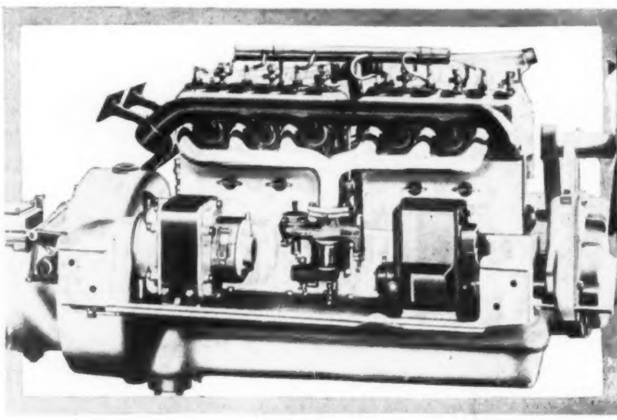


Fig. 3—Application of Westinghouse starting and lighting equipment to Chandler engine

The smaller model measures 9.25 inches long by 4.25 inches wide. The height is just under 6 inches. Due to economical design of the magnet casing the weight has been kept down to 18 pounds. The casing is a single steel casting having four poles only two of which are wound, the upper and lower. Straight series winding is used and the leads pass directly through the magnet frame to substantial terminals on the outside. Both endcovers are aluminum alloy aligned on the magnet facings by turned spigot and faucet joints. A large inspection door of the steel band type is provided at the commutator end for brush inspection. At the other there is means for adjustment of the endplay in the bearings.

The cover at the driving end can be made of various shapes to accommodate different methods of fitting the motor. In the one shown this is designed for bolting directly to a reduction gear case containing the sliding pinion which meshes with the teeth cut on the periphery of the flywheel. The average intermediate gear reduction in these cases is about 2 or 2.5 to 1.

This gear is left to the carbuilder, the only requirement being that the sliding pinion and the means of operating it, whether by pedal or hand lever, be so arranged that the starting switch can be actuated by the same movement. The switch is of the push type in a cylindrical casing, Fig. 4, except that when used in conjunction with a flywheel starter the pedal is removed and the center rod inserted in or otherwise connected to the sliding rod which operates the driving pinion.

Fig. 4 shows diagrammatically the relation of the motor, flywheel and a starting switch. In use the pedal at the right is depressed and the following action takes place: The shifter

rod, on moving to the right carries with it the sliding pinion P keyed to the intermediate shaft between the motor and flywheel. Directly after the beginning of this movement the contact piece A of the switch bridges the two brushes B, connecting the motor to the battery through the resistance R contained in the switch case. The motor then commences to spin idly but has only time to attain a slight speed when the current is shut off through the movement of the contact piece, which is then passing through the neutral space 2 and is entirely disconnected from the brushes. By this time the pinion has begun to mesh, which operation is performed without strain since the motor is running only by momentum at the moment of engagement. Further movement of the pedal causes the contact piece to come up against the main contact blocks C when the pinion is in full mesh and the full voltage of the battery is applied to the motor, the resistance being excluded.

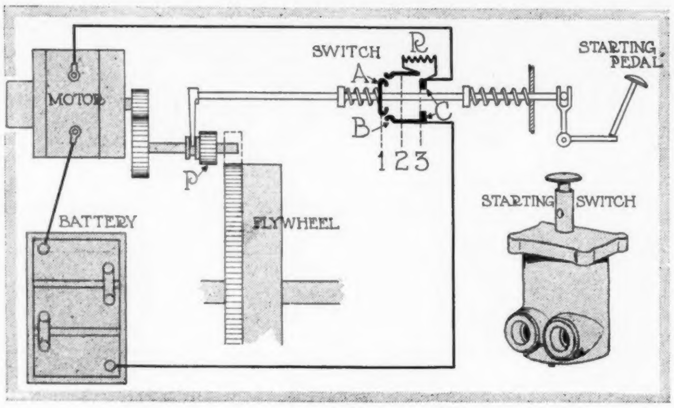


Fig. 4—Diagram of connections, showing simultaneous operation of the starting switch and the sliding pinion in the Westinghouse starting system. At the moment of engagement the switch is in a neutral position. At the right, pedal type of starting switch

This switch is furnished with springs on the moving contact piece to produce quick breaking. The contact blocks C are of semi-circular form so as to obtain a large surface area.

An over-running clutch is fitted between the motor and the flywheel pinion so that when the engine picks up there is no danger of driving the motor at a dangerous speed due to the comparatively high gear ratio between the motor and flywheel. Provision of the clutch insures the motor against being turned higher than its own operating speed.

Advantages of Chain Drive

Turning now to the other model Fig. 2, this is generally fitted for driving by chain, the chain wheel on the motor shaft being keyed solidly thereto and the other on the crankshaft operating through an over-running clutch. The latter is usually of the roller type which is suited to the purpose by its quick acting and releasing qualities. One great advantage of this method of starting is that no meshing and unmeshing of gears has to be provided for and there is therefore no need for special care in switching in the motor. All that is necessary is a simple switch which puts the motor across the battery mains. In the Westinghouse equipment the same switch is used as for the flywheel gear model but without the resistance, and having a push rod for direct operation on the floor board, as shown at the right of Fig. 4. Alternatively, a solenoid-operated switch may be fitted so that it would only be necessary to push a button conveniently situated on the dash or steering column.

The field magnet of this motor is similar to the other model, having series field coils at top and bottom and unwound poles at the sides. The armature winding however is different and only two brushes are used, arranged at right angles. The armature coils on both motors are former wound. The self contained reduction gear on the crankshaft driver consists of a pinion on the end of the armature shaft, meshing with three intermediate wheels arranged around it and these gearing in turn with an internally toothed outer wheel. The latter is keyed solidly to the shaft which projects from the motor casing and carries the chain sprocket.

Speed and torque curves from the two motors are shown in Figs. 5 and 6. It will be observed that the flywheel model exerts a torque of 4.75 pounds at the armature shaft at a speed of 500 revolutions per minute, when the motor is taking its maximum of 250 amperes. The maximum torque of the other model, Fig. 5, is almost 40 pounds, this figure being taken from the geared shaft.

Besides the two models described the same company manufactures two larger sizes of starting motor. One of these, similar in general design to Fig. 1, except that the height is 1.5 inches more and the width .75 inch more has been designed for cases where the flywheel is not large enough to allow the smaller motor to act efficiently. This model is wound and proportioned so as to provide a greater torque at the same speed. The other large model designed for crankshaft drive is fitted with an internal reduction gear of the planetary type, and weighs approximately 35 pounds. The overall height is 7.5 inches and the overall width 7.25 which dimension however is only at the gear case; the magnet casing is only 5 inches wide. This model is 12.25 inches long.

Method of Applying the Starter

One method of applying the Westinghouse starter to an engine is shown in Fig. 3. In this the flywheel casing is specially designed to accommodate the reduction gear and the motor is bolted up against it on the crankcase flange. This position lends itself to easy connection of the sliding gear, to the pedal. The same illustration also shows the generator of the same concern.

The generator can be mounted in any way suitable to the motor manufacturer and its compact shape makes it easily adaptable to either T or L-head types. The drive can also be arranged to suit any of the standard methods now in favor It is very well possible that the American manufacturers have learned a lesson from Olympia in neat generator mountings.

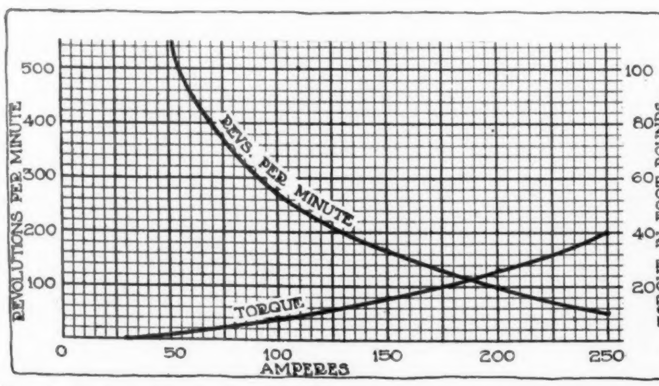


Fig. 5—Curve showing the relation of torque to speed and current consumption obtained from test of gear and motor Fig. 2

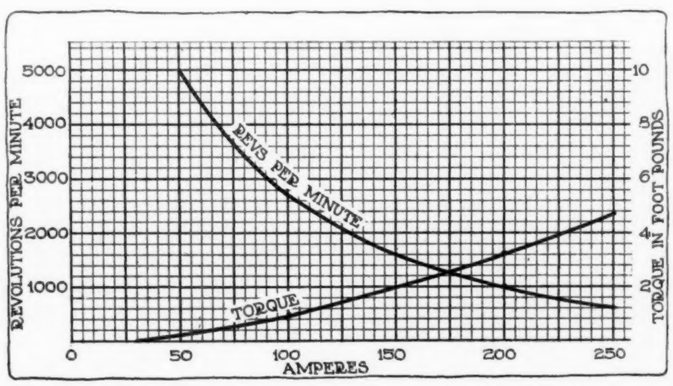


Fig. 6—Curves showing operating characteristics of Westinghouse starting motor, Fig. 1, for flywheel drive

The Rostrum

Car Owners Voice Opinions of Pertinent Topics

Opposed to All Tire Guarantees

EDITOR THE AUTOMOBILE:—Would it not be a good suggestion for all makers of casings and tubes to cut their present prices in two and make sales the same as any other good article—no guarantee on the casings and tubes and the users would get more mileage because they would be careful of their tires, drive more carefully and would keep them properly inflated. All cuts would be filled with a tire filler, which, incidentally, is a good thing.

We people are now getting tired of having to pay for the other fellow's tires. You will find a few honest people who do give to tire makers the exact mileage they get out of their casings. But on the other hand you will find so many people who will run a casing 4,000 to 5,000 miles and swear that they only got out of this casing 1,723.2 miles.

This thing is not right and should be adjusted by the makers. Makers could well afford to sell to the user a tire that sells for $30 now, for $15 and still let the middlemen make a reasonable profit.

Makers would make just as much on their goods as before and do away with all this adjustment and dissatisfaction to the users. Now comes the guarantee. If makers do not make the best tires possible the people would find same out and would quit that brand of casings. Why should tire makers guarantee their goods any more than the shoe man or clothing man? People who make good shoes do not have to guarantee, because they give the people satisfaction for the amount of money they paid. I am not blaming the makers for the high price on their casings, because the users are forcing high-priced tires upon themselves. Hence the maker has got to make some one pay for all these adjustments. I am for starting this movement for lower price tires. Should a man get hold of a bad tire once in a while he could afford to lose same if he doesn't have to pay more than one-half as much as he does now.

I would like to hear through the columns of THE AUTOMOBILE the ideas of the general public and tire makers.

Savannah, Mo. W. I. BROWN.

Is Against High-Speed Motors

EDITOR THE AUTOMOBILE:—I have read a great deal in THE AUTOMOBILE during the past year about the high-speed small-bore motor which has been developed in the foreign countries. I also note a great many of our American manufacturers are producing a motor of much higher speed type than they have ever done before. I think it makes no difference how well a motor may be designed, and the manufacturer can use the best materials possible and can balance his motors to the best of his ability, you cannot get away from the fact that this high-speed type of motor will wear out a great deal faster than the slow-speed type of motor which is built with the same care.

I have driven cars a great many years and I think the American public want a motor that will last a few years and not have to buy a new car every other year in order to have a nice, quiet and well-running motor.

Our conditions in this country are so entirely different than across the Atlantic. Their gasoline costs three times as much as in this country. Our taxes are almost nothing in comparison with foreign taxes and this has been one of the main causes of the high-speed small-bore motor which they have produced.

Our roads, as a rule, are miserable, while the foreigners have been constructing good roads for years. We need much more powerful motors on this side with enough power so you do not have to strain your motor under severe road conditions. I fully realize these small-bore, high-speed motors will travel very fast, but will they stand up for any length of time under American conditions? I would rather get less mileage per gallon of gasoline and have a motor that will last for some length of time. I am a firm believer in the long-stroke motor, but do not think the American manufacturer should follow the high-speed practice too far, on account of our different conditions. It would please me to hear from others on this, as I believe discussion would clear matters.

Cleveland, Ohio. L. B. LOCKWOOD.

Suggests a Chart for Intelligent Lubrication

EDITOR THE AUTOMOBILE:—I venture to submit to you a diagram of a lubricating schedule which I have used with great success, and which is somewhat different from any system that I have seen for owners who drive their own cars.

The whole basis of expending the effort necessary to follow a lubricating schedule lies in being convinced that it is important to be exact in such matters. An owner who does not care whether he changes the oil in his crankcase at the end of 1,000 miles or 1,500 miles, might as well guess at the distances he has run and does not need the system I advocate.

You will note on the diagram that I have typewritten the mileage down each side of the sheet, leaving a space at the left for entering dates. Heretofore I have entered the mileage in units of 150 miles. In this case I have doubled that to 300 miles, since those parts of the car that require care more often must be attended to practically every day the car is run any considerable distance. Certainly no one should require a reminder of this fact, and the items involved are few.

Down the side of the sheet are the names of the different parts that require lubrication. These are in groups. The first group requires lubrication every 150 miles, the second every 300 miles, the third every 500 miles and the fourth every 1,000 miles. After these groups are other matters, such as placing water in the batteries, cleaning the oil, gas and water strainers, etc. These may be considered as requiring attention every 1,000 miles. Certainly none of them should be allowed to go longer without an inspection.

This diagram is comparatively new. Hence you will notice there is very little on it except crosses opposite the 1,100 miles, indicating it was that point at which my car was thoroughly gone over.

The blank space between the names across the top and the right hand of the sheet is left open for tire and gasoline records, and all such matters on which it may be valuable to keep data; such as new electric lights, lubricating oil used, etc.

The date should be written in on the extreme left once a

month. Whenever lubrication or other matters are attended to a cross should be made under each heading and on the horizontal line opposite the odometer reading. Thus one may preserve a very interesting and valuable record which will also have an appreciable effect on the general care the car receives.

With this you can face a tire manufacturer, and demand adjustment without any qualms as to the legitimacy of your claims, and the life of the car will be prolonged under minimum repair bills.

New York City. F. T. Root.

Speed of Ford Engine at 30 Miles

Editor The Automobile:—When the Ford model T is traveling at 30 miles per hour, how many revolutions per minute is the engine making?

Ashland, O. H. B. V.

—At this speed the motor is turning over 1,245 revolutions per minute. This conclusion is reached as follows:

The gear ratio on high is 3 7-11 to 1. That is, the motor is turning over 40 times while the wheel revolves 11 times. As the car would have to traverse 44 feet in 1 second to go 30 miles an hour, the 30-inch wheel would have to make 5.71 revolutions in this time, or in 1 minute it would have to make 342.6 revolutions. In this time the motor will make 40-11 of that amount or 1,245 revolutions.

Why Gearsets Are Noisy

Editor The Automobile:—What causes most if not all cars to growl on low and intermediate speeds after being operated several thousand miles? After diagnosing the trouble, please prescribe the remedy and name in detail just what new parts should be substituted, if any, to make them as near noiseless as when new.

Beckley, W. Va. J. H. Hatcher.

—Excessive noise in the gearset when running on low or intermediate speeds, is due to worn gears or looseness in the bearings supporting the gear shafts. The former trouble is indicated by the condition of the teeth, and can be easily determined by inspection. The only remedy is to replace the worn gears with new ones, all attempts at a repair job being merely sources of annoyance and loss of time.

Each bearing should then be tested for looseness by grasping the shaft it carries up near the bearing and trying to shake it. If any great amount of play develops the bearing will have to be replaced, if it is of the annular ball or cylindrical roller type. If the bearing is a cup and cone roller type it may be adjusted by screwing up on the bearing cap located on the outside of the gearcase.

Old Car Used for Sawing Wood

Editor The Automobile:—I have noticed from time to time photographs in the Rostrum showing cars used for sawing wood. Thinking it would be of interest to some of your readers, I am sending a photograph, Fig. 1, of a wood saw made from the chassis of a 1905 single-cylinder Reo runabout. This chassis was sold to Mr. W. J. Clark, of Portland, Ore., recently for $100. Mr. Clark is averaging about $200 a month sawing wood for the users of this fuel in Portland, Ore. The car seems to be performing this duty in a satisfactory manner, and from all appearances is good for another 10 years. This might suggest the new use for some of the old chassis that would otherwise find their way to the bone yard.

New York City. J. W. Gogarn.

Information on Storing Car for Winter

Editor The Automobile:—Please publish in The Automobile how to store a car for the winter, describing care of tires, metal parts, top, body, motor, etc.?

Rome, N. Y. H. G. F.

—In storing the car for the winter the first thing to do is to

	150 Miles	300 Miles	600 Miles	1,000 Miles		
	Clutch shifter Steering connecting rod Spring bolt	Shock absorber Bearing Studs Truss rod forward Axle brace oilers Steering knuckle belt Fan Rear axle Clutch shifter shaft Steering cross tube	Brake clevises Spark and throttle Accelerator pedal Brake connections Foot brake pedal Change speed shaft Clutch pedal shaft Intermediate brake shaft	Reverse, bell crank Crank case Magneto bearing Front gears Generator Starting crank Generator front clutch Starter clutch shaft Steering yoke shaft Front wheel bearings Rear universal joints Front wheel hubs Steering gear case Start. interlock shaft Front universal Rear axle case Transmission	Water in battery Carbureter valve stem Carbureter gas screen Oil strainers (2) Water pump strainer Adjust shock absorber Drain water from gas Flush radiator Spring leaves	
Sept. 25, 1913. 0	X X	X	X	X		0
300	X	X				300
600		X	X			600
900		X		X		900
1200		X	X			1200
1500		X				1500
1800			X	X		1800
2100						2100
2400						2400
2700						2700
3000						3000
3300						3300
3600						3600
3900						3900
4200						4200
4500						4500
4800						4800
5100						5100

Chart for periodic lubrication of the automobile

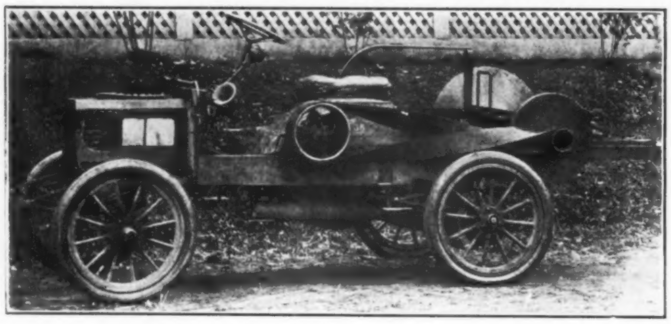


Fig. 1—Old car now sawing wood at a profit

give it a thorough cleaning, as any dirt that remains on all winter will be caked on by spring and will be found almost impossible to remove. The top should be raised, brushed thoroughly and washed well with castile soap and water. The side curtains should be given a similar treatment and hung up in a dry place.

—The tires should be removed from the rims, wrapped in paper to keep out the light and stored in a dry place which has a temperature between 50 and 60 degrees Fahrenheit. The shoes should be laid flat, as when they are stood up they bulge out of shape, due to their own weight. However, if it is desired to use the car occasionally during the winter it is best to jack up all four wheels and deflate the tires to about 15 pounds pressure.

—The water should be drained out of the cooling system by removing the plug or opening the petcock at the base of the radiators. Sometimes there is a special cock for emptying the pump, and this should not be overlooked.

—The only attention the motor requires is to empty the oil out of the crankcase and flush it with kerosene.

—Metal parts that are liable to rust or tarnish should be coated with lubricating oil.

Cannot Sell Big Cars in Australia

Editor The Automobile:—I cannot understand why American makers are building cars far and away too big and heavy for the average buyer in Australia and yet attempting to sell them here. They will have to climb down the ladder to something more moderate. Owing to the extraordinary weight of many of your cars people in Australia are now beginning to think that the British car is the cheapest in the end to own, although it is a little bit slower. There is at present a very strong tendency for the return to the British trade or European trade. Those agents of small American cars in Australia are beginning to feel the pinch of this drifting away from the American small car to the European car.

Another point I would like to impress upon American makers is the rear axle system carrying differential and gearbox which is meeting with severe criticism here. This construction certainly has its advantages but its disadvantages in Australia are very great.

Motor trucks are claiming a fast-growing market.

Sydney, Australia. S. L. Tyler.

Suggests Constant Compression Motor

Editor The Automobile:—Is the method of sucking gas into the cylinders all that could be desired? Wouldn't it be more satisfactory to force the explosive charge to the cylinders under constant pressure, thus obtaining uniform compression? Has this method ever been tried? What would be the effect of uniform compression?

Buffalo, N. Y. R. W. B.

—Everything considered, the most satisfactory method of filling the cylinders is by the method in common use. The method you suggest is open to the objection that you would need some kind of a pump to force the explosive gas in. This device would be bulky, would cost a considerable sum to make, it would take power to run it and the only advantage you would gain would be full charge of gas and the slightly increased power that would thus accrue would in no way compensate for the disadvantages mentioned. If a pump were used to force the charge in the volumetric efficiency would be slightly improved at high speed but the increased power resulting would be offset by the greater complication due to the pump and the power that it would take to drive it. A constant compression motor would be an impossibility unless present gas engine design were changed because constant compression would give a constant output at any given speed and there would be no means of varying the engine speed. Constant compression engines are used to some extent in stationary practice but in order to vary the load and yet keep the speed constant a governor has to be used which regulates the number of explosions per minute.

Formula for Intake Manifold

Editor The Automobile:—What is a formula for obtaining the proper dimensions of an intake manifold which is contained in the waterjacket of a four-cylinder, four-cycle motor of 3.5 by 5 inches. M. J. H.

Goshen, Ind.

—There is no special formula for obtaining the diameter of an intake manifold, but by assuming a pressure drop through it, it would be possible to figure out a diameter that would be somewhere near correct, considering the manifold as a passageway made up of a certain amount of straight pipe and a certain number of bends, and using the formulas for the flow of air through pipes as given in Kent or any other engineer's handbook. However, so much depends on the character of the interior surface of the manifold and the number and position of the bends that it would be better to follow standard practice and adopt a diameter of 1 to 1 1-4 inches.

Remarkable Economy on Long Run

Editor The Automobile:—On our trip from Flint, Mich., to Dunedin, Florida, made in a Buick 37 car, we averaged 22 miles to the gallon.

The total distance traveled was about 2400 miles. Our baggage, consisting of three suit cases, was all carried on the running board, in addition to this I had a tire trunk, which swung inside the extra tires on rear of car, in which I carried waste, several extra tubes, a few tools and a double block and 100 feet of line (this I carry for emergency and have never used), besides this one good axe, and a shovel. In nearly every instance I've found use for the axe and shovel, fixing some bad bridge or digging out of some mire.

I have made six trips over the National Highway and have never lost anything from my car, never taking anything from the car except what clothing I actually needed for the night.

The running time of my trip this time was 14 1-2 days from Flint to Dunedin, stopping over 6 days at my home in Sewickley, Pa. (suburb of Pittsburgh), before continuing South. I followed the Philadelphia Pike to McConnellsburg, Fulton County, Pa., and from this point turned southward through Mercersburg on to Hagerstown, Md. Here I struck the National Highway and followed it through to Lake City, Fla. From this point I turned south, leaving Jacksonville, Fla., off to the east some 70 miles, thus saving some 100 miles in distance in the run to Tampa, Fla.

The points I struck in going from Lake City, Fla., to Gainesville, Fla., were as follows: Mason, Mikesville, High Springs, Alachua and Gainesville. When you reach Gainesville you are then back on the Jacksonville-Tampa route. Mason and Mikesville are not overpopulated, in fact, some one has to tell you when you are in them, as the towns are only meagre settlements. A fairly good road is found from High Springs to Alachua and Gainesville, but from Lake City to High Springs consists of 30 miles of bad deep sand, for the most part very poor road directions, practically no markings, and settlements few and far between. I might add, not more than 3 to 5 miles of this can be made on high with any car made.

My night stops from Pittsburgh down were as follows:

Pittsburgh to Martinsburg, W. Va., 228 miles; Martinsburg to Staunton, Va.; Staunton to Roanoke; Roanoke to Winston-Salem, N. C.; Winston-Salem to Spartanburg; Spartanburg to Anderson, S. C. From Spartanburg we ran up to Asheville, N. C., for a day, the mountain scenery here was grand and a fairly good road all the way.

Coming back we again struck the Highway at Spartanburg and continued on to Anderson, S. C.

From Anderson to Atlanta, Atlanta to Macon, Macon to Valdosta, Ga.; Valdosta to Lake City, Fla.; Lake City to Gainesville, Gainesville to Tampa, and from Tampa here 26 miles of fine road, shell and rock.

The only distance I mention in any one day's run is from Pittsburgh to Martinsburg, W. Va., as this was the most day's mileage.

The worst roads were encountered between Roanoke, Va., and Winston-Salem, N. C., and between Lake City, Fla., and High Springs, Fla.; in the first instance it was bad mountain road and in the last it was Florida sand. I kept a close tab on the gasoline consumption down as far as Valdosta, Ga., and found I was getting about 22 miles to the gallon.

In some places I probably got as high as 25 (for instance through the Shenandoah Valley, and on the good roads of Georgia. Georgia makes more good roads with a less expenditure of money than any State I ever toured through. My father accompanied me on this trip as on the other five I had made before. We enjoyed every minute of it, and always made our objective point for night stops. I attribute my light gasoline consumption to several things, light load, light car, valve in head motor, good carburetter and last, but not least by any means, economy in the way I made my runs and the application of the gas to the motor.

Dunedin, Fla. S. C. Young.

Kerosene a Poor Cooling Agent

Editor The Automobile:—Some of the people here are using kerosene to cool their motors in the winter instead of water.

Will you kindly let me know what you think of this and if it is safe and practical to use kerosene in this way?

Mankato, Minn. J. E. B.

—Kerosene is not a good fluid to be used in the jackets in an automobile gasoline motor. In the first place, the specific heat of kerosene is very low, and the amount of heat carried off for a given rise in the temperature of the kerosene is small. If the weather should turn warm the kerosene would prove entirely inadequate as a cooling agent. In the second place, the heat of the motor vaporizes a large portion of the kerosene, and when this is combined with air a dangerous explosive mixture is formed. The slightest spark would cause an explosion and a fire that would destroy the car. Another reason against the use of kerosene is that it is destructive to the hose connections between the motor and the radiator. It also leaves a greasy deposit on the surface of the metal of the radiators, and the radiator is apt to be inefficient because of this film of grease between the water and the radiating surface. Altogether it is highly inadvisable to use the kerosene, as it has been stated previously in these columns.

Burning the Carbon from the Cylinder

Editor The Automobile:—Would you tell me of the use of oxygen in burning carbon out of cylinders and how it is used?

Bunceton, Mo. W. B. Wallace.

—This method of removing the carbon from the cylinder, which has come into vogue within the past year consists of consuming it in the presence of pure oxygen. A common oxygen bell or tank is used in connection with a brass or bronze jet fitted with a reducing valve for admitting the oxygen to the cylinder at any desired pressure. One of the valve caps is removed from the cylinder and the oxygen jet introduced into the cylinder. The valve is opened wide for a couple of seconds to blow any dead gases from the cylinder and then the pressure is lowered to about 15 pounds.

A wax taper is lit and brought into contact with the carbon that has collected within the cylinder, until it is ignited. In the presence of the oxygen the carbon will be rapidly burned away.

This method is simpler than scraping, but on some of the more inaccessible cylinder heads it is very difficult to reach all the carbon. It must be remembered that the cylinder upon which the work is being conducted must be in the firing position. That is, all the valves must be closed and the piston at the top of its stroke.

The objection which has been brought against this method of carbon removing is that the heat liberated by the combustion of the carbon would be dangerously high. Those using the system say, however, that they have never had any trouble in this way and that the heat does not seem to approach that created during the normal operation of the motor.

Contact Points That Separate

Editor The Automobile:—Are there any primary contact breakers on the market that do not permit the contact points to remain together should they happen to get together when the engine is dead, thereby allowing all the current to flow from the battery, unless a switch is opened by hand?

If there are any such contact breakers, please give me the patent numbers of them, or tell we where I can get a description of them, as I have made a contact breaker of this sort which works perfectly, and would like to know if I am infringing on any patent or if such a device is worth patenting.

Newark, N. J. Thos. R. Hassall.

—Magneto and coil makers state that they have had several of these devices brought to their attention, but as yet have never seen one that was a success. The reason given for this is that they have either been too complicated or else they were not infallible. It would seem that such a device would have merit because it would be one more step in the direction of making the car foolproof.

Formula for a Brass Paint

Editor The Automobile:—Please inform me if there is a paint made that I can apply without heat or electricity on brass trimmings of automobile, as radiator, windshield, etc.? I want to paint them black and want paint that will not scale off.

Bucyrus, O. Dr. C. H. King.

—A formula for painting brass in a manner that can be satisfactorily done by the amateur is the following:

Asphaltum	8 ounces
Dark gum anime	.5 ounce
Linseed oil	18 ounces
Dark gum amber	1.5 ounces
Turpentine spirits	2.5 ounces

Fuse together the asphaltum and gum anime and add 15 ounces of the linseed oil.

Boil the amber, previously fused with 3 ounces of the linseed oil and add to the mixture. Continue the boiling until a little of the mass, when cooled, is plastic. Then withdraw the heat and add the turpentine.

This is about the simplest process there is of painting the brass. The enamel process requires so much experience and skill that it is quite out of the reach of the amateur. Special heating devices, etc., are required in this.

Suggests Bypass for Cooling Water

Editor The Automobile:—It seems to me that there should be some way in which the driver would have the supply of cooling water under his control. That is, for example, have a pump with a greater capacity than is needed to cool the motor thoroughly and then have the excess water pumped through a bypass. The amount of water passing through the cooling system could be limited through this passage.

St. Paul, Minn. H. P. T.

The Engineering Digest

Agricultural Motoring and Its Importance for Enlarging the Automobile Market —Technical Status Still Chaotic

Glimpses from a Field in Which the Training of Automobile Engineers May Be Found Indispensable for Progress —Europe Anxious to Develop Machines Suited for Small Farmers But Riper Market Among Large Estates Diverts Production to Other Types of Lesser Ultimate Value to Public and Automobile Industry

MOTOR plows are technically nearer to the automobile than motorboats or aeroplanes, in so far as the highly variable demands made upon the power, the transmission elements and the reduction gears differ from those which have been made and met in automobile construction only by their much greater severity and complication, and because the problems relating to the weight of the machines, the wheels and the traction to be obtained from the latter by rotating them in contact with the ground present many parallels with the difficulties which arose when the experience with pleasure automobiles was made the preliminary foundation for the building of heavy motor trucks. When "motor plow" is taken as a generic term used for convenience to designate in a general way all agricultural implements which may be operated by motor power, including mowing machines, reapers, binders, harrows, planters, weeders, potato and beet digging machines, and many more, as well as the varieties of plows, such as subsoilers, shovel plows, disk plows, breaking plows, and when the economic desirability of keeping the motor plant of all such machinery employed all the year round and utilizing it, for example, for the transportation work involved in farming, is also considered, it is soon perceived that the field for the application of motor power to agricultural work is one which, by its extent and the demands it makes upon engineering ability and the ingenuity of inventors, is liable to dwarf the enormous field now occupied by the automobile industry and the motor truck industry, and also that the beginning for this relatively new extension of motoring activities could scarcely have been made before now, since it is only very lately that much progress has been made in adapting the internal-combustion motor of small size to fuels the supply and the price of which promise to become satisfactory. So intense is, however, the demand for a form of power by which the European farmer of limited means may be enabled to dispense with the hired help which he needs badly but cannot get, that the European automobile industry in its leading circles for several years has looked upon the "motor plow question" as one in which it is directly concerned, if for no other reason than because the farming communities will not be able to buy many automobiles unless their purchasing power is stimulated by having a new factor—the motor power—placed at their disposal for getting more profits out of the soil; and a part of these higher profits, it is understood, must go into higher wages for the human help which after all cannot be spared, so as to stem the tide of agricultural workers toward the higher wages and livelier existence of the cities.

European Automobile Manufacturers Strongly Interested

The Automobile Club of France and the *Automobil-Technische Gesellschaft* of Germany have identified themselves with the motor plow movement to the extent of fostering technical progress in this line, as best they may, although it is realized that a difficulty of the severest order confronts them in the matter of uniting in a sufficient number of persons a thoroughly practical knowledge of machine design with an equally thorough knowledge of the requirements of scientific farming. While it is generally acknowledged that such a union of knowledge will never really be accomplished, it is hoped that, on one side, the farmers will modify their methods of tilling the soil so as to be able to make use of imperfect motor implements for a while, and, on the other side, that designers, if they cannot learn the science or practice of farming, will at least gradually find out all about the mechanical movements of tools which are necessarily involved and will be able to reproduce these or find acceptable substitutes for them. The disk plow in various forms and cultivators with blades of shapes never before used or with elastic prongs for stirring the earth are among the developments in this direction which have already met with a measure of success, although they have not been accepted as finally suitable, as time has been insufficient for deciding whether the crops obtained by cultivation with these instruments compared favorably or otherwise with crops obtained by the customary methods of tillage.

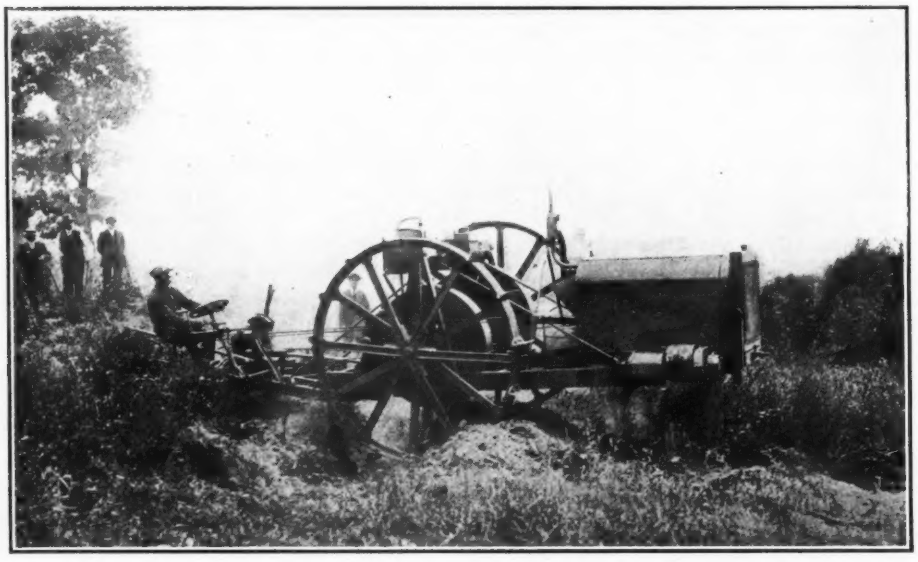


Fig. 1—Motor plow made by the Stock company in the act of crossing a wash-out. The most successful motor implement made in Germany for estates of moderate size

Two Distinct Types of Machines

Details of the development of motors and mechanical elements suitable for agricultural work which has been going on for several years in a rather haphazard fashion and which is at length getting into more profitable channels, cover far too broad a scope to admit of treatment in an automobile journal. Only the

general relations to automobiles and automobile manufacture can be explained from time to time, especially as these relations are at present much closer in Europe than here. American steam plows and steam tractors and even American motor gang plows drawn by means of internal-combustion motors—either directly or by cable—play a very important part, to be sure, among the machines used and discussed in Europe, but they are large and expensive machines mainly intended for rough work on a large scale. They are therefore used in Europe, as in the West and Northwest of America, only for large estates making a specialty of a single crop and which could not be cultivated at all without them, considering the state of the labor market. The development in which the automobile industry is interested is much less concerned with this class of heavy machinery—for which the market is found only in spots and under special conditions—than in motor machinery adapted for those millions of farmers who work on a small scale and are compelled to practice intensive cultivation with all the arts of husbandry in order to make a small acreage yield a good living for one family and living wages for a few workers attached more or less closely to the household. Only this class of farmers is sufficiently numerous to make their economical welfare a matter of commercial interest to the automobile industry, apart from the prospective interest attaching to the development of motor machinery intended for advancing this welfare. In the United States practically all farmers East of the Missouri river belong to this class, and if they have not yet clamored for motor implements and have been able to buy many automobiles without having the aid of motor implements in their work, this apparently more favorable condition is largely due to fresh soil, more acreage per family, low valuations, small mortgages and the fact that they have been accustomed to get along with little paid labor and have never really contemplated the more elaborate forms of cultivation which are compulsory among farmers of corresponding class in Europe.

If this class of American farmers, who count many millions and who are now looking for ways and means by which they or their children may become enabled to cultivate all their acres and get a maximum of revenue from each acre, can be placed in possession of motor machinery which will help them to this end, it becomes evident that, here as well as in Europe, the chain of causes and effects must eventuate in a far larger and steadier market for automobiles of all descriptions, even if the manufacture of the motor implements referred to is not taken up and developed by the same firms which are now engaged in making pleasure cars or trucks.

Difficulties of Design Numerous

The great diversity of viewpoints and interests which must be taken into account in the designing of motor plows and the other implements were brought out through a discussion which took place after a lecture on the subject last spring before the *Automobil-Teschnische Gesellschaft* of Germany and which is reported extensively in *Der Motorwagen* of September 10. The discussion came under the following divisions:

(1) Universality, the question of the number of different purposes for which a motor machine may be successfully adapted, (2) utilization of the whole motor power with shovel plows and shallow plowing, (3) availability for digging potatoes and beets, (4) for pulling reapers and binders, (5) for pulling farm wagons out of a field, (6) for transportation work, (7) for certain forms of transportation work, (8) the adaptation of plows to given soil conditions, (9) the motor, the best type, (10) working hours, (11) plowing by artificial light, (12) the actual cost and maintenance cost of the animals to be replaced, (14) experience with the Ihace motor plow (American, I. H. C.), (14) plowing by electric power and (15) the pressure of motor machinery on the soil,

Occupying ten pages in the original the remarks can here be rendered only in highly abbreviated form.

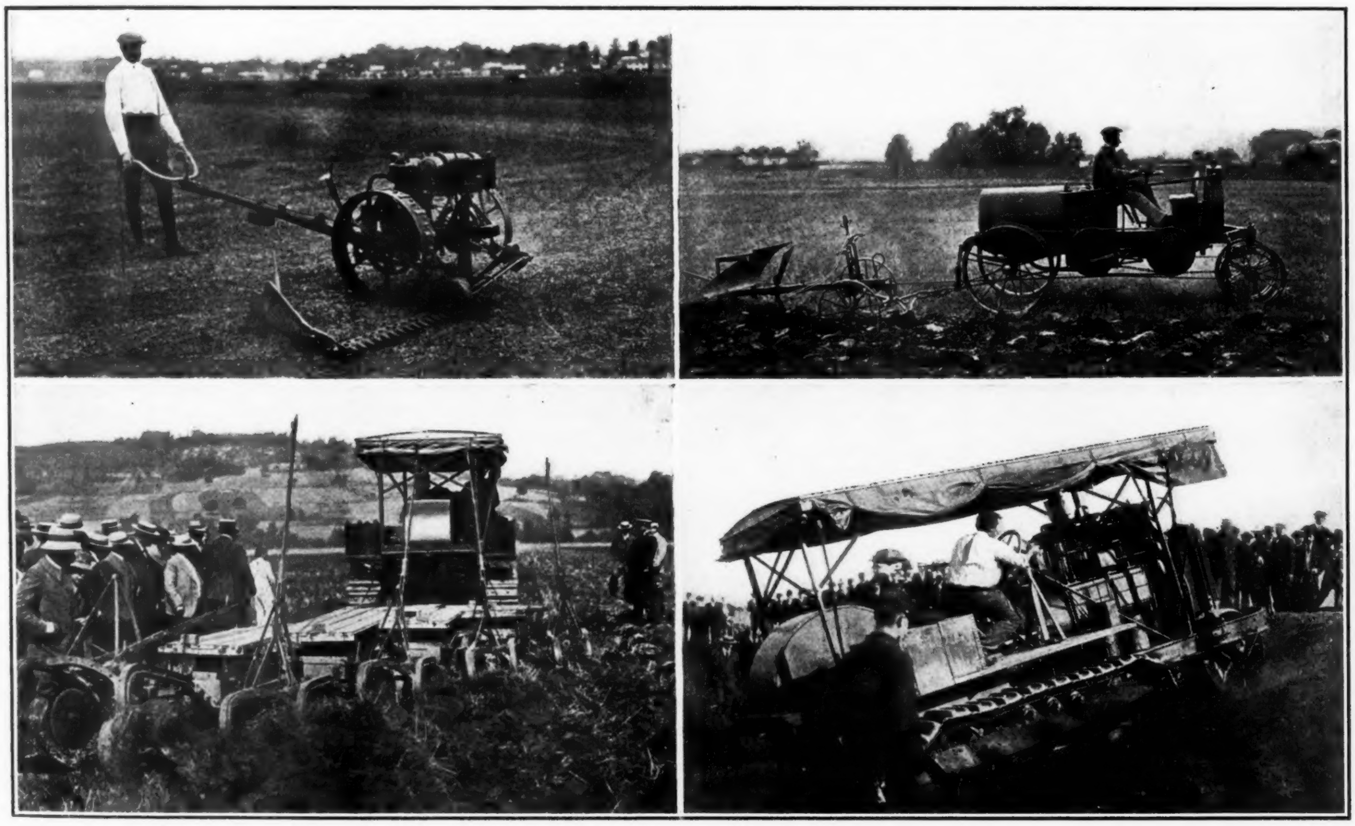


Fig. 2—Mowing machine with motor propulsion adapted for farms of any size.—Fig. 3—Light French plowing machine working with winch on vehicle and anchored cable.—Fig. 4—Caterpillar tractor pulling a gangplow.—Fig. 5—Same tractor climbing an incline

Single or Diversified Working Scope

(1) Shall the motor plow draw such other implements as rollers, harrows, cultivators, manure spreaders, drills?

A director of *Neue Automobil Gesellschaft* thought that he and other technical persons felt competent to design machines for a single purpose but that a universal machine might become somewhat like the diagrammatic horse afflicted with all the 194 horse diseases which is used for instruction in veterinary schools. While a motor plow proper may be sold for from 3,000 to 4,500 dollars and can pay for itself at this price if employed for 4 to 5 months of the year, a universal machine would necessarily cost 6,000 to 8,000 dollars and the power required for plowing would be much larger than necessary for the other purposes.

An engineer for 35 years identified with electric plowing emphasized that the suitability of the motor plow for deep plowing (10 to 12 inches for potatoes, for example, and up to 20 inches in cases) had not yet been proved. He thought it indispensable that the same plow used for deep plowing in beet and potato cultivation could be used for mulching and for turning over the stubble. Its additional use as a tractor for the transportation of heavy loads was at all events very desirable, partly after the harvest and also for fetching fertilizers from the railway station and spreading them over the fields.

One potato farmer asserted that he could use a simple motor plow steadily from July to March, but he had been strongly impressed by the Lanz machines built for doing all the required kinds of work at the same time.

The manager of a very large estate in Kurland, Russia, declared that with the short season for preparing the soil in that region and the shortness of help no work was possible there at all without motor plows, and now the gasoline prices had made them unprofitable. His motors were being remodeled to use heavier fuels. A machine which could do all the work quickly would mean the doubling of the prices paid for farming land under such conditions.

Driving Speed a Moot Question

(2) Whether the motor power shall be utilized to the full, in the case of shallow plowing, by increasing the speed, by hanging more plowshares after the machine or by adding a rotary disk harrow, is a question still undecided.

It was held by some that any plowing done at a speed in excess of 5 to 6 kilometers per hour would be poor and by a representative of steam plows that the fastest plowing was the best; 9 kilometers per hour was none too fast. But it was said in objection that steam plows cannot do shallow plowing at all, yet this is the most useful of all farm work. With disk plows the whole subject was changed; here the working speed is not identical with the driving speed. At any rate, with smaller driving speed less work is lost in propulsion.

No Substitute for Cable Found Yet

(3) An engineer of the Siemens-Schuckert works considered that no motor plow could do the work of digging beets. If the wheels were narrow it could not get over the soft field, let alone doing hard work besides, and a work varying immensely with the nature of the soil; if they were broad it would injure the crop. A machine drawn by cable was the only one to use. He was seconded. But beets do not require a harvesting machine so much as potatoes, it was considered, because much human help was needed anyway for beet cultivation all the year round. Whether the motor plow could dig potatoes was a more important question. This was still harder work than digging beets. Anybody who can build a successful potato digger could become a millionaire over night. The consensus was to the effect that it would be hard, for beet and potato culture, to beat the machine drawn by a cable from power made stationary, and the same held true for wine culture where the machines must be pulled up and down steep hillsides.

(4) Machine designer Spitzer from Bucharest, Roumania, said that the immense estates in Rumania required both motor plows and tractors capable of pulling 5 or 6 reapers and binders, as in northwestern America.

(5) It was held that almost any motor plow could be arranged to pull wagons full of potatoes or beets out of a soft field by means of a winch and a cable.

Transportation Problem Separate

(6) The value of a motor plow as tractor will only then be worth the complication involved if it can pull a load of 10 to 15 tons distributed upon 2 or 3 trailer wagons to the railway station or the market. An engineer objected that such a motor plow is a street locomotive and not a plow. Another that the plow will be busy plowing just when such transportation is of most value. Still another that the main advantage of the motor plow compared with the steam plow is its smaller weight, which is inconsistent with heavy tractor work. The two purposes should be kept separate, even if it may be true that the motor plow machine might receive part of the load and thereby gain adhesion enough to pull the rest.

(7) The best chance for facilitating transportation work was considered to lie in the building of narrow-gauge rail lines shortening the distance of field and road transportation.

Revolution in Soil Tools Necessary

(8) It was brought out that the weight of the Ihace motor plow (American) had gradually been increased from a weight of 6,000 to one of 9,000 kilograms and its power from 30 to 90 horsepowers, which was not a favorable indication for light motor plows, though it might simply indicate that the market as yet lies with the very great estates. Examples were mentioned of cases where the Stock motor plow (German), of which it is said that 100 to 200 have been sold during the past three years, failed at deep plowing (10 inches) and failed likewise, only more pronouncedly, where the soil was full of stones; yet under other circumstances it gave very good and profitable service. A manufacturer observed that the design by which rotary disks or soil millers were used and the work of plowing was in itself utilized also for propulsion—the rotary tools turning in the same direction as driving wheels—had been proved satisfactory and solved the question of adhesion, weight and gripping irons on the wheels.

(9) The remarks made on the motor question were not illuminating, except to show that weights and speeds constituting a low-class engine are still preferred in Germany, partly in view of the inexperience of the rural workmen in handling motors and partly because little has been done to absorb the damaging shocks received when the plow runs against a stone. In the Stock plow the motor is one of 40 horsepowers working best at about 600 revolutions per minute and relatively light. By suspending it far in front of the driving wheel axle, as shown in the illustration, Fig. 1, its entire weight is made to safeguard the adhesion of the wheels, which also are equipped with 3 exchangeable sets of gripping-blades, and the plow, comprising six shares, balances against this weight to the rear and can moreover be loaded to increase the adhesion. [This feature of the Stock plow, which also is valuable for crossing ditches and mounds, is being imitated, for example in the single-share 4-horsepower motor plow produced by Wyles Brothers of England.]

Dusty fields and low speed make it undesirable to take air for the radiator from the front, and the breather pipes, it was said, should have their mouths well protected.

Daily Hours and Night Work

(10) While steam plows are operated 15 hours per day during the summer without shifts, only 10-hour days can be figured on for motor plows, and for the short days of the late fall this is reduced to 8 hours. In all only 110 to 120 working days in a year may be counted upon as the average in Germany.

(11) Acetylene lamps have been tried with motor plows and for harvesting and electric lighting with electric plowing, with which form of work it is convenient, and the working day in spring and fall has in this manner been considerably lengthened. An objection to plowing by artificial light is that it is difficult to plow straight furrows unless the workmen can see far ahead for

guidance, and the light has a range of only 10 meters. If headlights are used, the glare interferes with signals. Technically possible, night work has come to naught, so far, because the men object; at 2 to 3 o'clock in the morning they leave the machines and go home.

(12) The cost of work by horses or oxen, for comparison, is of little value, whether figured per day, year or acre, as the absence of help makes it impossible to keep more than a certain number of animals and the main object of the motor plow is to take more acres under cultivation than could otherwise be handled thoroughly.

(13, 14 and 15) The remarks made referred mainly to large estates. The American motor plow was praised, also with regard to deep plowing, but the objection was made from other sides that only the feasibility of work but not that of profits was shown. It was urged in favor of disk plows and soil millers that their lighter weight does not compress the soil too much and that, on the other hand, the heavy machines pack the soil as deeply as 18 inches. This was in favor of the German Lanz machines, on the use of which the cultivation of a considerable number of German and Austrian estates is now based.

Estimated Working Capacity and Weights of Starters Operated by Compressed Air Shot Into Cylinders

STARTERS operating with compressed air either send the air direct to the motor cylinders or turn the crankshaft through a separate air motor. The required storage of energy, weight and dimensions of the starters belonging to the first of these classes is of primary interest, as starters of the other class so far have been more costly and complicated.

Air is stored in one of the well-known seamless steel bottles in which the pressure seldom exceeds 30 atmospheres if it is generated by a compressor forming part of the equipment. Higher pressures can be had if the bottle is furnished charged from outside establishments, but the other arrangement is usually preferred. A bottle of medium size has a volume capacity of about 20 liters and holds therefore 600 liters of air under a tension of 30 kilograms. [The author figures, roughly 1 kilogram per square centimeter equal to 1 atmosphere.] To start the motor a pressure of about 3 kilograms [equal to about 41 pounds per square inch] on top of the piston in a cylinder usually suffices, and to produce this a pressure of about 4 kilograms at the discharge nozzle of the bottle may be required, owing to losses in the throttling mechanism, since the dimensions of valves and conduits usually are made very scant in apparatuses of this kind.

For the first moment of the starting a sharp blow equal to a pressure of perhaps 5 or 6 atmospheres is needed to overcome the initial inertia, but as this can be produced by a very brief manipulation of the starter-handle, and lasts for a moment only, it need not be considered in a rough calculation.

Supposing the motor to be started is one of 4 cylinders with 80 by 130 millimeters bore and stroke and that the two cylinders having a working stroke during the revolution are to be 35 per cent. filled, there will be required for one turn of the crankshaft an air volume in liters—one 1 liter equalling 1,000 cubic centimeters—of:

$$\frac{2 \times 4^2\pi \times 1.30 \times 0.35}{1{,}000} = 0.45 \text{ liter.}$$

As the bottle supposed to be used contains 600 liters, it can furnish 150 liters with a tension of 4 kilograms and, according to the foregoing figures, it can thus produce about 300 revolutions of the crankshaft, which corresponds to a running-time of from 3 to 5 minutes. [It probably does not escape the reader that if the cylinders are to be filled completely, including the volume of the combustion chamber which the author disregards, and if the pressure required for imparting sufficient speed to the pistons is taken to be 80 to 100 pounds per square inch instead of about 40 pounds, the number of turns of the crankshaft which the equipment will supply is reduced to less than 50, and this would perhaps be better in accordance with actual conditions. The author's method for estimating the requirements to be made of a compressed-air starter seems more convincing than the suppositions on which his figuring is based.—ED.]

The bottle weighs 16 kilograms. The compressor with its driving mechanism weighs from 10 to 20 kilograms, according to its design and the number of compressor-cylinders, and the average may be taken as 15 kilograms. The air valves and distribution mechanism on the motor cylinders, the conduits, pressure gauge and the operating rods must weigh about 20 kilograms more, bringing the total weight of the starter outfit to 50 kilograms. If now the work required for one revolution of the crankshaft is taken to be 17.3 kilogram-meters, as calculated for spring-starters [see THE AUTOMOBILE of November 20, page 974], the air bottle of the supposed size is seen to afford $17.3 \times 300 = 5.200$ kilogram-meters, and the working capacity of the outfit in kilogram-meters is thus about 100 times as great as the weight of the outfit in kilograms [which figure, as said, might be conservatively divided by 6 or 7.—ED.].

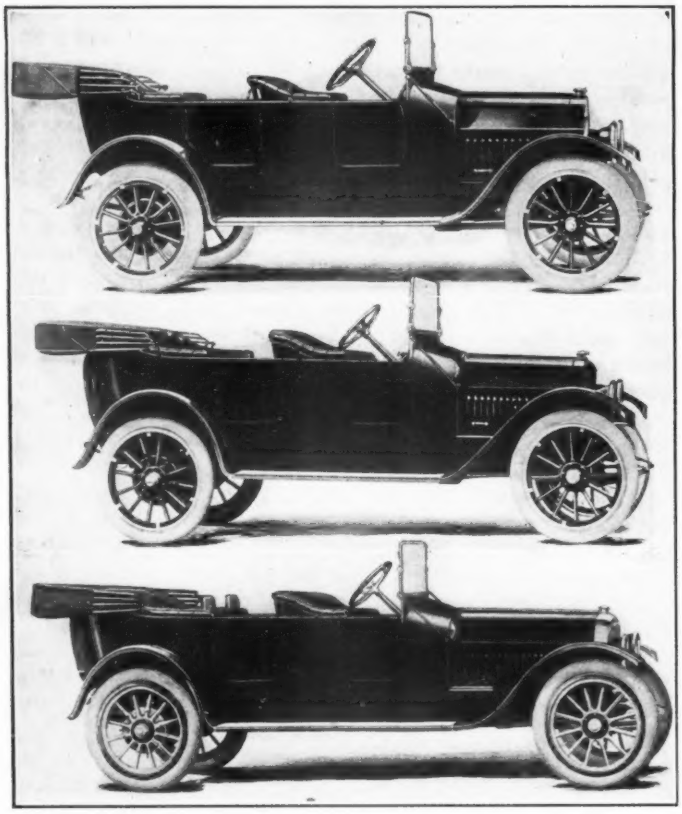
The conditional value of this estimate is not to be overlooked, as, for example, it would not add much to the weight if a larger bottle were used, while the work capacity would be much increased. A bottle 60 per cent. larger would weigh only 5 kilograms more but would, on the other hand, be 1 meter long and would scarcely be suitable for pleasure vehicles.

With regard to reliability a good many small factors are against the compressed-air system. It must be difficult to keep the numerous tubular connections air-tight, especially in a vehicle which does not run on pneumatic tires and is more or less subject to vibrations. In some of the starters in the market the admission valves on the motor cylinders are liable to wear, and the valves in the small compressors, unless they are kept cool better than they usually are, will be sure to cause trouble sooner or later. Each construction will have to be judged on its specific merits at these danger points. The price of the compressed-air system is in most instances and especially when high compressions are used, higher than that of any other. The weight is satisfactory for large vehicles but considerably too high for light cars. In compensation for these drawbacks, the system affords a most convenient facility for the inflation of tires, and this may have an economical value by inducing motorists to keep tires inflated at the pressures at which the wear of them is minimum.

Overcoming the Cooling Due to Expansion of Air

A technical objection to the system of sending the compressed air directly into the vehicle motor lies in the cooling of the cylinders which this method involves and which results in making the conditions for ignition and starting gradually less favorable if the start is not effected at once. To this objection may probably be traced the origin of the more complicated system of cranking the vehicle motor by a special air motor, unless its adoption should be explained on the ground that it may be more readily applied to a completed car, while the simpler system should preferably be provided for in the design of the motor and the arrangements of its accessories. A method exists, however, by which the objectionable cooling may be circumvented. It was adopted for the Doué starter but apparently has met with little favor, owing perhaps to unfelicitous details. It consists in sending the compressed air to only two of the four cylinders, while arranging the discharge of air in these two cylinders on the two-cycle principle and depending on the speed imparted to the crankshaft for getting ignitions in the two remaining cylinders of the motor.

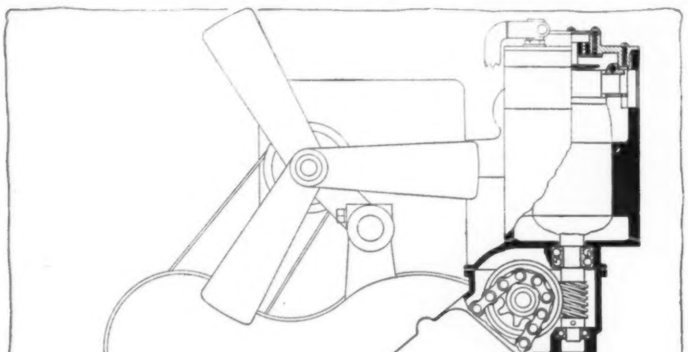
The author completes his consideration of the subject by a description of the compressed-air starter shown in connection with Wolseley cars at the recent Olympia exhibition.—From *Automobil-Rundschau*, October 15.



At the top is illustrated the Jackson Olympic for 1914. This is a four-cylinder, five-passenger touring car, selling for $1,385, fitted with the Jackson company's own electric lighting and cranking system, as against $1,500 for 1913 without this equipment

In the middle is the Majestic, the larger four-cylinder type, selling at $1,885, as against the 1913 price of $1,975. This five-passenger touring car is much like the smaller model, but is rated at 45 horsepower, as compared to 40 for the Olympic. The fuel is carried in two tanks, a service tank in the dash and a main tank at the rear

At the bottom is the big six-cylinder, seven-passenger Sultanic, the price of which has been reduced from $2,650 in 1913 to $2,300 for the new season. The five-passenger Sultanic has been cut from $2,500 to $2,150. Electric lighting and starting are included



The Jackson electric starter, showing the vertical mounting as well as the driving mechanism. This electric system is fitted to all models for 1914

Jackson Reduces Prices for 1914

Adds Electric System to All Models and Dash Fuel Tank to Olympic—No Other Important Chassis Changes

THE same three Jackson models are on the market for 1914 as were offered this year, these being Olympic and Majestic, four-cylinder types, and the Sultanic six-cylinder model. Adhering closely to the same design throughout, the three show very little alteration, either in chassis or in bodies over 1913, although prices have been reduced considerably.

The Olympic, the smaller of the two fours, is, in the new edition, to be equipped with electric cranking and lighting of the same type as used on the other two models, and sells for $1,385 as against this year's $1,500 without this electrical apparatus.

The Majestic four is offered at $1,885 as against the 1913 price, $1,975, and the six has been materially reduced from $2,650 for the seven-passenger and $2,500 for the five-passenger edition to $2,300 and $2,150 for these two models, respectively.

Olympic Model's Dash Gasoline Tank

Practically the only chassis change is the removal of the pressure gasoline tank from the rear of the chassis of the Olympic. On the 1913 model there was, besides a service tank under the cowl, a storage tank at the rear which carried the bulk of the fuel. The liquid was forced by pressure from this rear reservoir to the dash tank, going from the latter to the carbureter by gravity. On the new Olympic only the dash tank is used, feed being entirely by gravity. The Majestic and the Sultanic six, however, retain this two-tank construction as outlined.

Slight body changes have been made, but as a whole the cars are still characteristically Jackson. Fenders have been given more of a curve to follow the wheels more closely and the shallow boxes, which ran the length of the running boards heretofore, have been eliminated. The rounded radiator has been retained on the Sultanic and Majestic, although the Olympic still appears with a flat type.

The Olympic—Small Four Model

The Olympic, the smaller of the two fours, is the leader of its line for 1914. This car has a long-stroke, L-head motor with cylinders cast in pairs, the bore 4⅛ inches and the stroke 4¾ inches, giving an S. A. E. rating of 27.25 horsepower with a piston displacement of 253.9 cubic inches. This rating is low and, according to the maker, the actual developed horsepower is 40.

The power plant is of the unit construction with the clutch and gearset housed within an aluminum case bolted to the rear of the flywheel housing through a substantial flange. Arms extend from this flywheel-inclosing portion to the frame and there is a single support at the center of the front end. Thus the power plant is three point suspended.

The motor design is conventional in every way. There are three of these crankshaft bearings, which are of the plain type with die-cast babbitt surfaces. The camshaft also has three bearings and is driven through helical gears. The pistons are of gray iron, have three rings each and are fitted with piston pins of steel tubing.

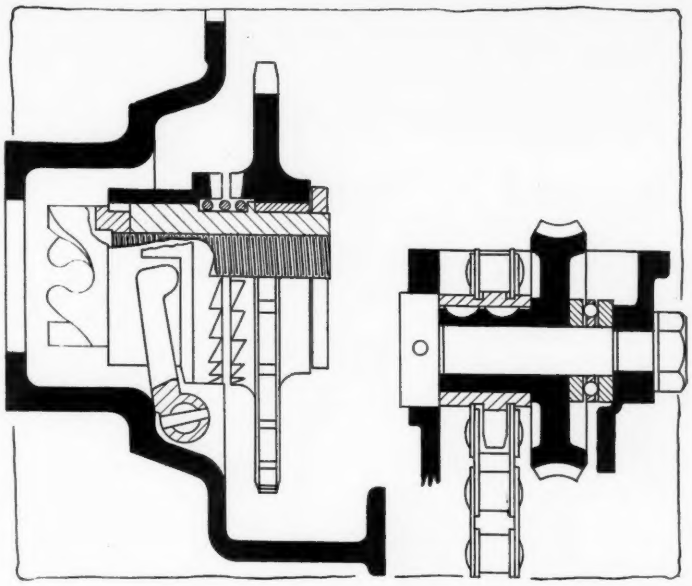
The tungsten steel valves are interchangeable and have the usual form of beveled seat and their stems and springs are completely inclosed by cover plates.

The cooling system is of the positively circulated water type with the centrifugal pump located on the right and driven by

the same shaft as the low-tension magneto. The latter is back of the pump.

Lubrication is by the force feed system, the oil being pumped from a large reservoir in the base and forced to the bearings.

The electric cranking and lighting system is made complete by the Jackson company, with the exceptions of the motor and generator, which are the Auto-lite. The starting motor and the generator are separate units and the cranking apparatus has a novel mounting at the front of the engine. The motor armature is placed vertically, the motor standing on end, instead of resting horizontally. This electric motor is wired direct to the storage battery, a Willard 120 ampere-hour one.



Detail of the mounting of the electric lighting and starting system designed by the Jackson company for its 1914 models. The entire system is made by the Jackson company except the motor and generator, which are of Auto-lite manufacture. Note the ratchet clutch employed to connect the starter to the engine. At the right is shown the silent chain drive of the generator in detail. A general view is given in the illustration on page 1070

Foot Switch Operates Starter Motor

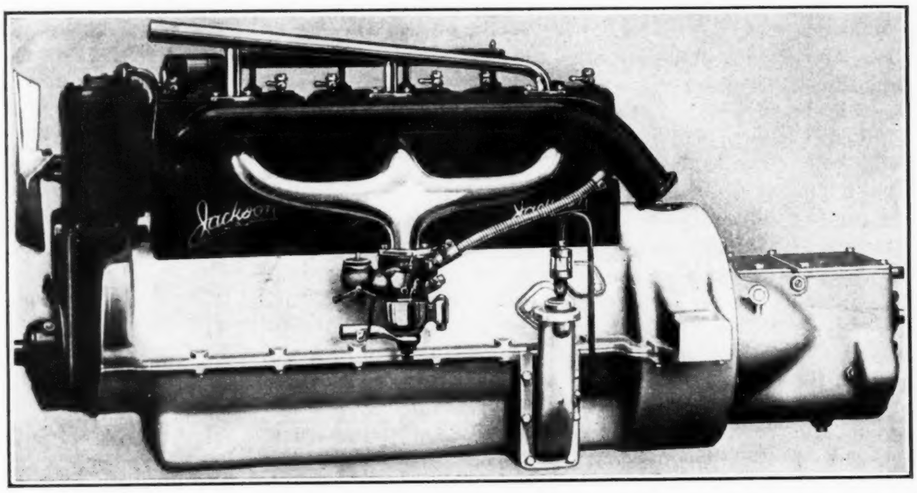
A foot switch operates both motor and ratchet clutch which connects the starting motor to the engine. The armature shaft carries a spiral gear which engages a gear on a countershaft and keyed to the countershaft is a sprocket which drives a sprocket on the crankshaft through a silent chain. The crankshaft sprocket carries one member of the ratchet clutch. When the starting switch is operated the other ratchet member, which slides on the splined starting shaft, is mechanically brought into engagement with the sprocket member and the engine is cranked. As soon as the engine, by its own power, turns faster than the electric motor would drive it, the ratchet is automatically disengaged.

The generator is mounted on a bracket on the right front above the magneto and pump shaft and is driven by a silent chain from a sprocket mounted on this shaft at a speed of 2.5 times as fast as the crankshaft speed. The system works at 6 volts, and a centrifugal governor limits the output of the generator to the requirements of the battery. In order that the battery cannot discharge back through the generator when the car is standing idle, a reverse-current cutout is provided, which is of the magnetic type controlled by a voltage coil. The cranking motor weighs 33 pounds and is of the series-wound type. It spins motors of the average stiffness from 80 to 100 revolutions a minute.

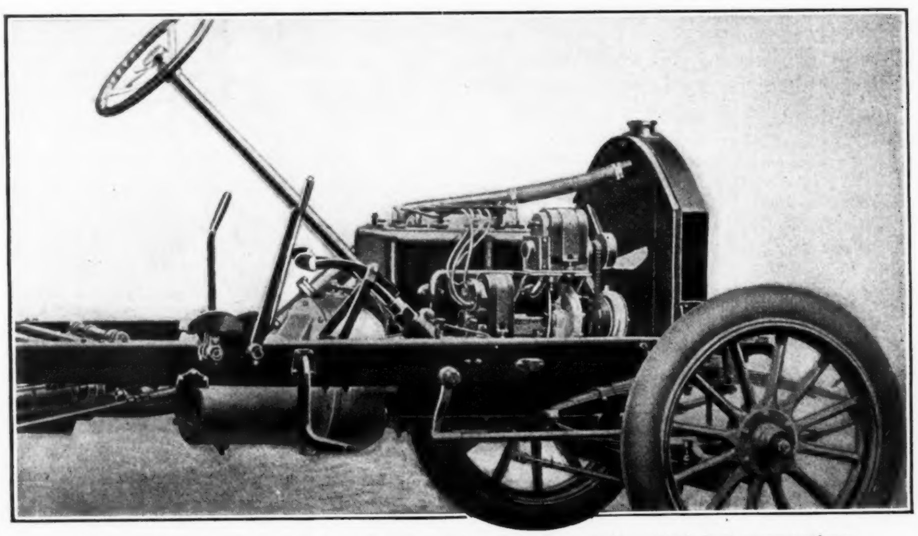
As already pointed out, the gearbox bolts to the rear of the crankcase and provides three speeds forward, selectively obtained. The entire gearset is in accordance with standard practice, the power coming back to it from a leather-faced cone clutch working in the flywheel as usual. Both gears and shafts are of special alloy steel, ball bearings playing an important part in the shaft mountings. The diameter of the mainshaft is 1⅜ inches, and the jackshaft 1¼ inches. The stubshaft is provided with a roller bearing at its front end, lubricated through an oil passage in the shaft.

The propeller shaft is inclosed within a torsion tube and it has a universal joint at the forward end. The rear of this tube bolts to the semi-floating axle housing. Radius rods run from the axle to the side frame rails on either side.

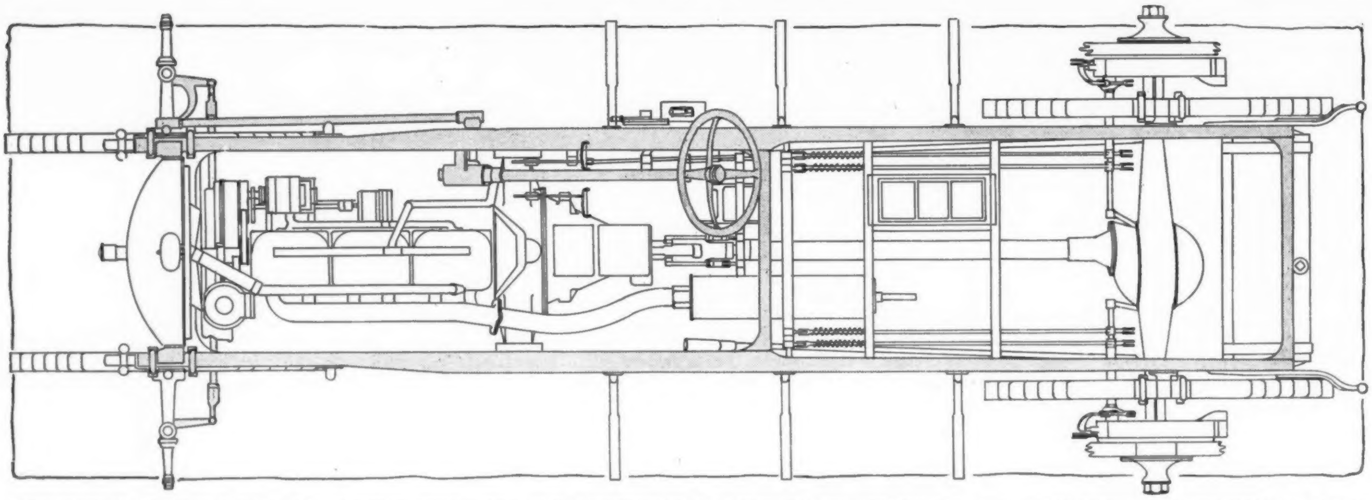
The spring suspension is at variance with that found in the average car in that elliptics are employed, front and rear. These rest on the axles and in the rear are outside of the frame. This



Left side of the six-cylinder motor used in the Sultanic, showing vertical mounting of electric cranking motor at the front



Side view of chassis of the Majestic, giving an idea of the electrical connections



Plan view of Jackson six chassis, showing unit power plant suspended on three points, floating rear axle with drive shaft inclosed in torque tube, position of storage batteries

method of frame support is said to give a very resilient action, making for easy riding, and to further add to its free movement the upper half of each rear spring is fastened to the frame at its center in a trunnion mounting.

Steering and control are on the left. The wheelbase is still 115 inches and the tread 55 inches. Tires are 34 by 4 all around and are mounted on demountable rims. The equipment is complete at the price.

The Majestic—The Large Four

This larger four-cylinder Jackson is practically the same mechanically as its smaller brother, into the details of the construction of which we have just delved. But though its motor is of the same design and type and has the same earmarks, the Majestic is rated by the maker at 45 horsepower, since the cylinder dimensions are 4½ by 5¼ inches. These give a stroke-bore ratio of 1.17, an S. A. E. rating of 32.4 and a piston displacement of 334 cubic inches. The cylinders are in pairs, the unit power plant feature is adhered to and valves are on the left. Ignition, cooling and lighting and starting systems are uniformly in accord in design and construction with these features of the smaller four which we have investigated.

Unlike the Olympic, however, is the method of drive on the Majestic, in that an uninclosed propeller shaft equipped with two universal joints connects the gearbox with the final drive. A torsion rod parallels the shaft and radius rods are on either side running from a point near the ends of the axle housing to the side frame rails. This year's semi-floating rear axle has been replaced by a floating construction.

Outside of these differences the Majestic chassis conforms in a general way to that of the Olympic, dimensions being different wherever necessary. The wheelbase is 124 inches and its tires are larger than those of its smaller running mate, 36 by 4. Its equipment also takes in everything needed for immediate road work.

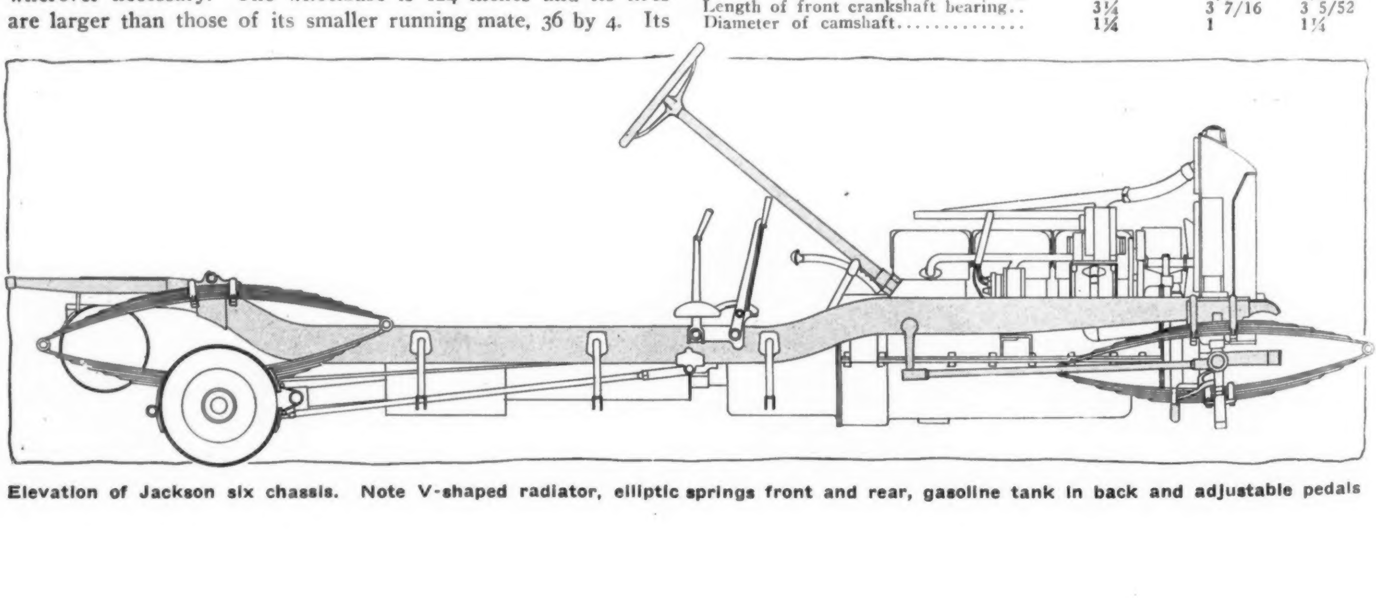
The Sultanic—The Six Model

The Sultanic is a big, luxurious model on a 138-inch wheelbase in the seven-passenger style and a 132-inch wheelbase with a five-passenger body. It has a motor whose design conforms closely to that of its two partners. It is rated at 55 horsepower and with cylinders of the L-head type case in pairs 4⅛ by 4¾. The engine has the same dimensions as the Olympic, its S. A. E. rating is 40.9 horsepower and its pistons displace 380.8 cubic inches.

The starting and lighting units are essentially the same as on the other two motors, and the gearbox, having three speed changes, is also housed in unit with the engine. Back of the motor the power is transferred to the floating axle through a drive shaft inclosed within a torsion tube, as on the Olympic. Spring suspension is the same, right drive and control are used, and at the extreme rear of the chassis is the main gasoline tank which feeds to the service tank in the dash. The frame is double dropped and stronger than that of the other cars, to provide for its larger bodies, and its tires are 36 by 4½ inches in size.

The principal power plant dimensions are compared in inches:

	Sultanic	Majestic	Olympic
Length of piston	5¼	6 1/16	5¼
Length of connecting-rod	11	10	11
Diameter of piston pin	1	1¼	1
Length of piston pin bushing	2¼	2 9/16	2¼
Diameter of connecting-rod bearings	2⅛	2	2⅛
Length of connecting-rod bearings	2¼	2¾	2¼
Thickness of crankshaft cheeks	1	1¼	1¼
Width of crankshaft cheeks	2 11/16	2½	2 11/16
Diameter of rear crankshaft bearing	2¼	2⅛	2¼
Length of rear crankshaft bearing	3⅞	4½	3 15/16
Diameter of center crankshaft bearings	2⅛ and 2	2	2
Diameter of front crankshaft bearing	1⅞	1⅞	1⅞
Length of front crankshaft bearing	3¼	3 7/16	3 5/52
Diameter of camshaft	1¼	1	1¼



Elevation of Jackson six chassis. Note V-shaped radiator, elliptic springs front and rear, gasoline tank in back and adjustable pedals

New England—The Automobilist's Premier Touring Ground

(*Continued from Page* 1043)

per cent. of the tourists visiting New Hampshire also enter Vermont, it would give some real figures. There are many Massachusetts motorists, for instance, who go up to New Hampshire and back without going to Vermont, and the same may be true of Maine. On the other hand, New York has so many cars that motorists from there run across, frequently bringing up the total. So if New Hampshire had approximately 18,500 cars, with 55,500 visitors, on the basis of 75 per cent. for Vermont it would mean about 13,875 cars, with 41,625 tourists.

Rhode Island and Connecticut also share in the influx of visitors. Narragansett Pier and Newport bring a horde of cars to that state every summer. Then there are the shore resorts like Rocky Point and Warwick Beach, where they allow Sunday ball games and other sports. Many Massachusetts and Connecticut motorists go there every Sunday during the year. No records are kept of visiting cars. However, as there are about 11,000 automobiles registered this year, and at least 5 per cent. of them comprise visiting machines, that state having a 10-day clause like Massachusetts and New Hampshire, it is easy to figure 550 registered, that is, belonging to visitors. As many of the motorists making the Ideal tour run go up through Hartford to Springfield, and cut Rhode Island out of their itinerary, a fair assumption for each registered non-resident would be about 10 cars. That would give some 6,050 cars, with an average of three to a car, making a total of 19,150. Allowing for the extra visitors, it would be nearer 20,000, perhaps. The summer people from all over the country who go to Narragansett Pier and Newport have cars, some two or three, so these figures are really conservative and, in the height of the the touring season, perhaps, even low.

That leaves Connecticut. This state being on the through route going and coming from the New England resorts gets the whole stream of traffic. There is no non-resident law to bother visitors. Many New Yorkers and others have summer homes along Long Island sound, and they have their automobiles. Thousands of Ideal tourists swing through there. Many New Englanders, especially from Massachusetts, go down to the shore resorts. So it is one steady stream going through the state. The Massachusetts figures give about the best basis. Of the 950 registered machines of non-residents in the Bay State perhaps 800 of them entered the Bay State through Connecticut. The other 150 would provide for those coming by way of Albany. If the total visiting cars of all descriptions for the summer was about 25,000 it is safe to say that about 80 per cent. passed through Connecticut going or coming to New England. So that would be about 20,000 cars, with 60,000 people. There is no doubt but what there were many cars, perhaps 800 or 1,000, that went into Connecticut from New York at one end and Rhode Island at the other that did not visit any of the other New England states. Therefore, the Connecticut total would be pretty close to that of the Bay State. Whatever it was, the figures show that New England is the real mecca for motorists because of its wonderful natural advantages, and until the other sections of the country get good roads the great mass of visitors will invade this section.

Horsepower Per Litre Cylinder Volume

(*Continued from Page* 1051)

of pressure his figures show that he has maintained a mean effective pressure of 100.011 pounds up to 3,200 r.p.m. This pressure is remarkably good, taking into consideration the speed The mean effective pressure in the specially built sleeve-valve engine at 3,000 figures out 103.8 pounds.

Peugeot Mean Effective Pressure

The exploiters of the Peugeot claim for their racing motor a mean effective pressure of 127 pounds at 2,600. We have developed in this same size sleeve-valve a pressure of 115 pounds at 2,000 with a slightly altered port setting, but this same setting did not carry the torque line up to 3,000 so well as the setting which reduces the pressure at the lower speeds. In short, early opening and late closing of the exhaust and early opening and late closing of the intake in the sleeve-valve bring about high pressures at high speeds, the same as in the poppet-valve. But for touring-car work, where speeds above 2,000 are absolutely useless, a port setting permitting a curve as shown from the 3¾ by 5⅛ is much preferable. That is to say, the high torque and pressures to be useful should come at speeds within the range of the car's practical operation and not at a speed prohibited by practically all authorities.

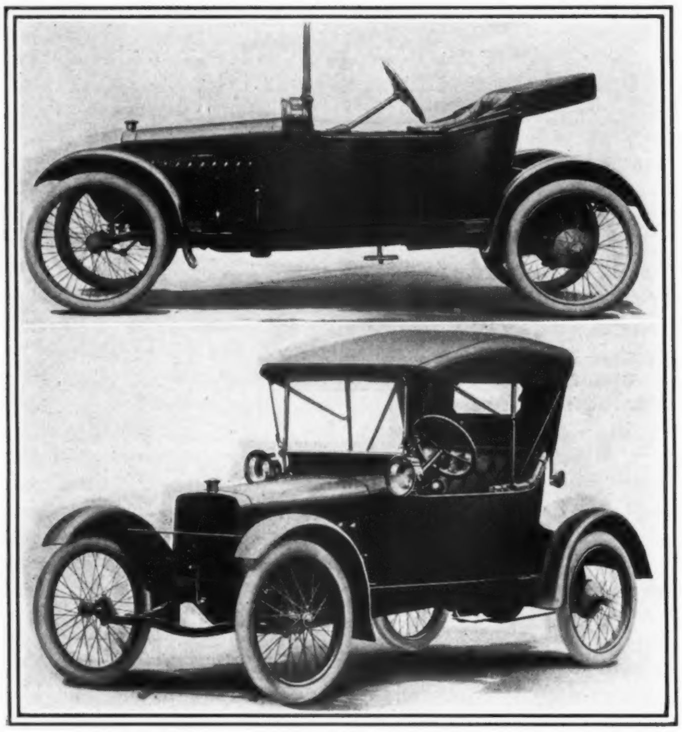
The Limit of Spark Plugs

Reverting again to the question of extreme speeds, I may say it has been the general experience upon this side that spark plugs do not stand for any length of time at speeds above 2,600 r.p.m. When over 3,000 r.p.m. are attained the insulation very quickly breaks down, and the metallic points fuse. This is not attributed so much to the heat of the combustion as to the tremendous current generated by the magneto under such extreme conditions, and speeds of over 2,600 r.p.m. are therefore of little if any use.

It has been my observation and experience of 12 years that it is extremely unwise for any writer upon the subject of internal combustion engine efficiency to dogmatize. Particularly is it hazardous for the designer or expert in one type of motor to pass judgment upon the capabilities of a specimen of another. Mr. Delling possibly assumed that every sleeve-valve motor produced for standard work has been made with maximum efficiency. This is just as great a mistake as he would have made should he have assumed that efforts had been made to cause every 4 by 6 four-cylinder poppet-valve engine to come up to an efficiency of 24.9 horsepower per litre of piston displacement.

While it is true that one of the most valuable features of the sleeve-valve engine is the fact that the standard type does develop more power than the standard type of the poppet-valve motor, all conditions of carburetion, compression and ignition being equal, the sleeve-valve, like its poppet-valve predecessor, requires for the attainment of its maximum efficiency special carbureter, special port setting, special pistons, connecting rods, and high intelligence in its handling. And such special motor, while more nearly suitable for touring-car work than its poppet-valve sister, is *not* to be recommended for use by the person who desires soft, flexible running with a minimum of silence and economy of operation.

For this reason such special motors are neither being constructed nor operated with any regularity. They are not wanted by the public, they are impractical commercially, and I am firmly of the opinion that their exploitation at the hands of those who race them mislead the public and is a positive detriment to the industry.—CHARLES Y. KNIGHT, Coventry, England.



Side and three-quarter front views of Saxon small car to sell at $395 or $400, and made with 96-inch wheelbase, 28 by 3 inch tires, cantilever springs, two-speed gearbox on rear axle and weighing 900 pounds. The motor cylinders are 2⅝ by 4 inches

Chalmers Men Launch New Saxon Light Car

Company To Start Deliveries March 1—Saxon Is a Real Miniature Car

ALL mystery connected with the Saxon Motor Co. was cleared away with the announcement just made of its organization in Detroit for the purpose of building and marketing a two-passenger automobile to sell under $400—probably $395. The organizers make it a point that the Saxon is a small motor car of standard design and standard tread and not a cyclecar.

The new Saxon company is a Michigan corporation capitalized for $350,000, of which $250,000 is common stock and $100,000 is 7 per cent. preferred. Although the majority of the stock is held by men connected with the Chalmers Motor Co., the two corporations are entirely separate and distinct. The directors are: Hugh Chalmers, Lee Counselman, G. W. Dunham, H. W. Ford, C. A. Pfeffer, C. A. Woodruff, H. H. Pinney, C. C. Hinkley and Percy Owen. Some of the other stockholders are: James Levy, Chicago; John Shank, Chicago; C. M. Steele, C. C. Cross, H. M. Wirth, J. T. H. Mitchell, Chicago; John Nelson, Kansas City; C. F. Lott, L. R. Scafe, R. J. Goldie, C. F. Jamison, Carl M. Green, R. O. Gill, Charles Chalmers, Philadelphia, and R. E. Cole.

The officers are: H. W. Ford, president and general manager; G. W. Dunham, vice-president; L. R. Scafe, secretary and treasurer; H. M. Wirth, purchasing agent; C. C. Cross, factory manager; C. F. Jamison, sales manager; R. E. Cole, chief engineer.

Mr. Ford, president and general manager, has been connected with the Chalmers company almost from its inception. Starting as advertising manager, he was later elected a director and secretary. During the past 2 years he has also occupied the position of assistant general manager. He will still retain his directorship with the Chalmers company, serving in an advisory capacity in connection with the sales and advertising departments.

Hugh Chalmers states that he will not be connected with the Saxon company in an executive capacity.

The Saxon has a four-cylinder motor of the L-head type, with the cylinders cast in block and crankcase integral. The bore is 2⅝ inches and the stroke 4 inches. Valves are of generous size, with steel stems and cast iron heads. The crankshaft, of special drop-forged steel, is carried on two large bronze bearings, babbitt-lined. The camshaft is of drop-forged special steel, 1 inch in diameter with integral cams. It is driven by helical gearing.

The motor is lubricated by a vacuum-feed oiling system with splash distribution. The cooling system is of the thermo-syphon type with tubular radiator and fan. Ignition is by the Atwater-Kent system, using six dry cells.

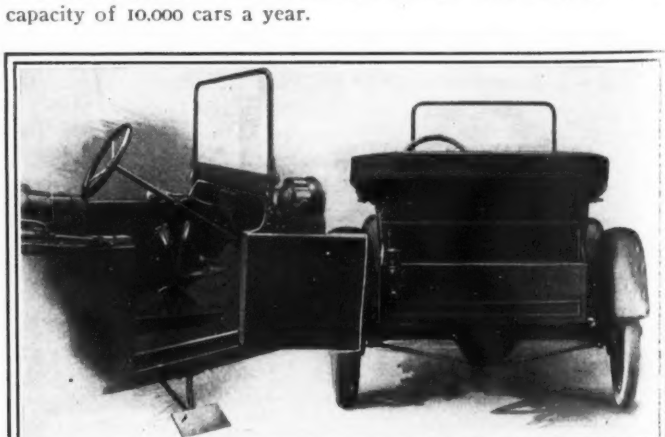
The gearset, which is carried on the rear axle, is of the sliding gear progressive type, giving two speeds forward and a reverse. The drive is by shaft within a concentric torque tube, the driveshaft having one universal joint. The clutch is of the dry plate type—three plates, steel on Raybestos.

The axles of the Saxon are of standard type, the front being of the usual I-beam section and the rear axle a semi-floating one with pressed steel housing. The outer end of the driveshaft is carried on Hyatt roller bearings. There are two sets of brakes on the rear wheels, the service brake, 8 inches in diameter, is lined with heat-proof material and the emergency brake is of the internal expanding style, steel on steel. Both brakes have 1.25-inch face.

The Saxon is a left-hand drive car with center control levers. The throttle is controlled by an accelerator, and the spark control is placed on the dash. The steering mechanism is of the double-gear type with drop-forged steering connections. A 16-inch wheel carried upon a 1¼-inch steel tube steering post is provided.

In body design the Saxon is very attractive. The two-passenger body is of the streamline type with plenty of room for two good-sized people, the seat being 40 inches wide and 16 inches deep with 30-inch space between the heel board and the dash. The doors are 18 inches wide.

Other details of the car are channel section, pressed steel frame; standard tread; 96-inch wheelbase, and 28 by 3-inch tires on wire wheels. The weight of the car is 900 pounds. It has cantilever spring suspensions, front and rear, the springs fastening to webs on the side of the frame. The clearance is 8½ inches at the lowest point. The car has a 6-gallon gasoline tank in the cowl. Its fuel consumption is said to be from 28 to 30 miles per gallon in ordinary running. The factory has a capacity of 10,000 cars a year.



Control parts of Saxon light car, showing left-hand steering with center levers. To the right is the rear view of the Saxon, showing pressed steel housing on rear axle, the gearbox being a unit with this axle

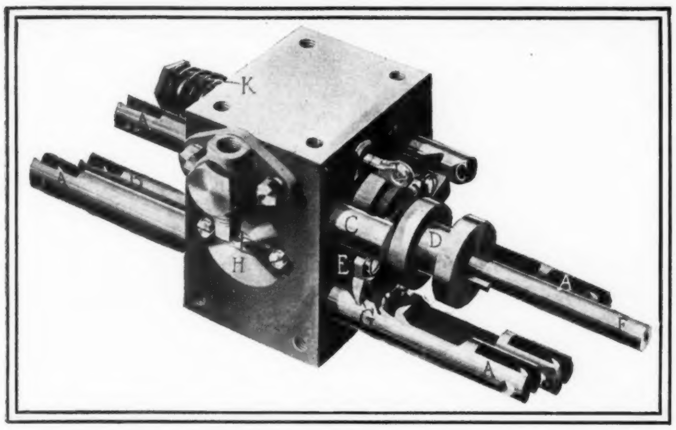


Fig. 1—Exterior view of gearshift, showing general appearance

Gray Gearshift Includes Starter

Can Be Easily Installed on Either Old or New Cars

THE Gray Pneumatic Gearshift Co., 1840 Peoples Gas Bldg., Chicago, Ill., is putting on the market a complete pneumatic gearshifting and starting system. The Gray system has been designed for installation on cars at present in use as well as for equipment on new cars about to be manufactured. Very little complication is caused by installing the gearshift, the work consisting of making connection to the air supply, a rod or cable to the clutch pedal and a connection with the selector shaft. The latter unit is the shaft that performs the shifting operation in place of the manually operated lever.

The Gray starting unit is a reciprocating air motor which is attached to the crankshaft in front of the radiator. The manufacturers claim that it will turn over the average motor at more than 300 revolutions per minute. Built integrally with the starter is a double-acting two-cylinder compressor which automatically maintains any desired air pressure up to 300 pounds per square inch. Located, as this unit is, in front of the car it has the advantage of being accessible, easily installed and enables the car manufacturer to keep his engine free from auxiliaries which might render certain adjustments rather difficult to get at. The gauges, compressor control, starter valve control, shut-off valve and connection for the tire inflation hose are all carried on an instrument board or dash plate.

Operation Is Simple

The operation of the gearshift may be simply understood from the two illustrations, Figs. 1 and 2. A, A are the two main shifting racks which are attached to the gearshifting rods of the gearset. These racks are forced forward by means of the selector latch G operated by a double-acting piston working in a cylinder bored out of the center of the main casting. In this manner the two forward shifts on the ordinary three-speed-and-reverse gearset are made. The two backward shifts are made by engaging the selector latch with the idler shifting racks C and C, which, when forced forward by the admission of air into the cylinder, drive the main shifting racks backward by means of a pinion gear protected and inclosed by the cover plate H.

The selector shaft F is connected to the selector quadrant on the steering post. The desired gear is selected by turning the selector shaft so that the latch G engages with the rack operating the gear required. Air is admitted at the intake J and enters the cylinder through a valve operated by cams on the distributing valve K. This sliding valve is drawn forward by depressing a clutch pedal to which it is connected by a cable or rod at the eye, L.

The first movement of the clutch pedal as far as half depression results in the admission of air to the selector end of the cylinder at the instant the clutch is fully disengaged and thus all gears are forced to neutral by means of the selector disk E. It will be noted that both shifter racks are made with a shoulder which is engaged by the selector disk on the return movement of the piston and thus all gears are disengaged. A selector disk E, is attached to the outer shouldered end of the piston rod by a threaded collar so that it can be rotated freely by the selector shaft F to which it is keyed and upon which it slides with the movement of the piston.

When the clutch pedal is fully depressed, the air is exhausted from the selector end of the cylinder and admitted into the other end, thus forcing forward the selector mechanism which carries with it the particular shifting or idler rack engaged by the selector latch. In the illustration is shown the position of all the racks when the gears are in neutral and the selector latch G is engaged with one of the shifting racks ready to make a shift of one of the gears.

Hand Lever Furnished

For four-speed gearsets a fifth shifting rack B is added. With this no idler rack is required as this rack operates only one way. This last rack is of course also under the control of the selector disk E in bringing all gears to neutral. Should any emergency arise whereby the air mechanism is inoperative a hand lever which is furnished with the installation is connected with the collar D and can be used for shifting purposes.

Fig. 2 gives a cut-away view of the Gray pneumatic gearshift and shows the exact relationship of the parts to one another just after a shift has been made and the clutch re-engaged. It will be noted that the sliding distributer valve is being pulled forward by a half depression of the clutch pedal and the ring cam has lifted the main intake valve by means of the hardened bell crank which will admit air into the forward end of the cylinder. The backward stroke of the piston will bring all gears into a neutral position.

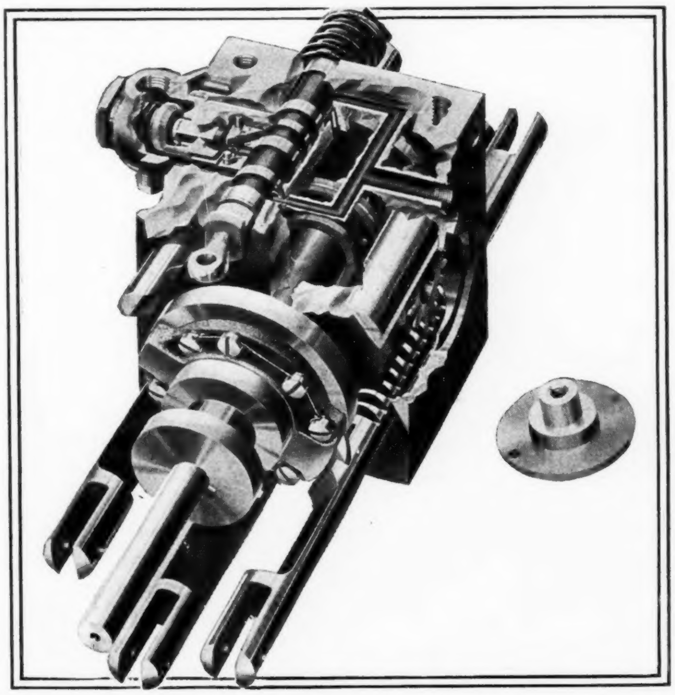


Fig. 2—Cutaway view, showing exact relationship of the parts to one another just after a shift has been made and before the clutch is re-engaged

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Out-of-Work Gossip

UNFORTUNATELY for the automobile industry there are floating in many of the biggest automobile centers a number of out-of-work people, who have taken themselves to mischievous gossip with the hope of entrenching themselves with some employer to the extent of getting a job with him. These gossips believe that the more damaging tales they tell about competitive concerns the stronger are their chances for employment, but with ostrich-like certainty they are pursuing the most direct route to non-employment. The tales of factories closing and receiverships circulated by many such gossipers are unfortunately accepted by many in the industry who should know better, who should be closer to the pulse of the industry, but who, as facts show, are not.

Boosting is what is needed. Let everybody boost. The industry is solid. Dealers in many cities have reported a 33 per cent. increase in sales over a year ago; many accessory concerns report heavy increases over a year ago. People are going to continue buying automobiles and accessories as they have done in the past. One optimistic eastern dealer who always sees all sides of the industry looks for a shortage of cars by the middle of April or May 1. Sell cars, and sell accessories is the real advice. In slack seasons spend greater energy, use better judgment and keep constantly and consistently hewing to the line. Be a booster. In other words, see conditions as they actually are and do not sit sullenly around, victims of your own imagination.

Educate the Salesman

HOW many of your salesmen can state clearly what are the best-designed and best-manufactured parts of your car?

How many of your salesmen can tell intelligently to a prospect the many ways in which your factory aims at obtaining accuracy in construction of the car in order to give the best wearing of parts, which also means that these parts remain quiet after continued use because they are made accurately?

How many of your salesmen can state fluently and convincingly to a buyer what special machines the factory has installed in order to make production on a basis of accuracy possible?

How many of your salesmen can tell truthfully the reasons why the car you are selling is worth $500 or perhaps $1,000 more than another make of car that carries as many passengers as yours, can take as steep a hill on direct drive and carries as large tires as the car you handle?

How many of your salesmen know enough of those cars that are your biggest selling rivals to intelligently give reasons to an intending buyer as to why your car is actually better than the rival car?

Let every automobile dealer handling a force of one or a dozen salesmen ask himself these questions. Let him turn the spotlight on his own business. Let him ask himself why he is not selling as many cars as some other dealer?

Let every automobile salesman handling a force of salesmen actually ask his salesmen these questions. Let him start a sales kindergarten. Get down to real selling business.

The days of the automobile shows are at hand, and the public is getting brushed up on its 1914 automobile lore. This public is reading about self-starters, about electric generators, about electric, pneumatic and mechanical gearshifters; and the salesman, who will make good, must be primed to the minute with this information. He must have it at ready command when called upon. He must know his car when brought face to face with the buyer who wants such information. He must not then have to go to some other salesman to ask the question and get the facts. The salesman who will finish high up is the one who will not be found wanting when the facts as asked for above and similar ones are requested by the dealers.

The psychological salesman is comparable to a general commanding the various divisions of an army in an engagement. The general may have 100,000 men at his disposal but he does not throw them all into engagement at once. He brings detachments into the conflict as needed, as occasion demands. But the 100,000 breeds confidence. So with the salesman; his knowledge of accuracy in manufacture, his knowledge of good materials, his knowledge of superior design, his knowledge of good production methods all breed confidence, yet he may win his sale without having to bring a single one of them into the foreground; but if driven to the extremity he has one and all at his disposal, and it but remains with him to marshal them into action as the circumstances demand, and as he is able to analyze the mental state of the buyer.

Roller and Silent Chains Studied by S.A.E.

John R. Cautley Presents Paper on Their History, Design and Use Before Metropolitan Section of the Society—States That Silent Chains Dating Back to 1905 Are Still in Use

NEW YORK CITY, Nov. 28—At a meeting of the Metropolitan section of the Society of Automobile Engineers held here John R. Cautley presented a paper on Roller and Silent Chains, Their History, Design and Use. Mr. Cautley pointed out that the two most important principles of a roller chain that met the requirements of standardization are: First, maximum wearing surface for the minimum of weight consistent with the required strength; and, second, such a proportion between roller diameter and sprocket as will allow the maximum wear on both with proper gearing.

History and Development Traced

Mr. Cautley traced the history and development of the silent chain itself as well as its applications. Of particular interest was the fact that many of the silent chains the history of which dates back to 1905 are still in use although they were made with plain unhardened links operating on hardened pins. The most modern chains incorporate a split bush or liner for the larger sizes and in the smaller sizes a hardened steel bushing is inserted in the links to provide the best possible bearing surface.

An interesting part of Mr. Cautley's paper was on the silent-chain gearbox. He stated, that these were first in use in England in 1897 being developed at that time by T. W. Hampson, both for machine tools and self-propelled vehicles. In 1898 the Lancastershire Steam Lorry Co. had an omnibus in the street that was actually fitted with a change-speed device of this kind. The most marked development of this type of gearbox is that adopted by the General Omnibus Co. and which has frequently been described. The feature of this box was that it had a direct drive whereas its predecessors were all indirect drive. Mr. Cautley concluded with the following summary:

"Never use a tightening device on the back of a silent chain. I know of no really satisfactory installations of this character.

"An idler sprocket may be used but must start with at least three teeth in engagement. This is owing to the difference in gearing with the chain running as a rack, and when running over sprockets.

"If the chain runs over three wheels for any purpose adjustment must be provided. Accuracy of chain and sprockets and mounting is just as necessary with both silent and roller chains as with gears, but this is easier to obtain with chains.

"Adjustment is always advisable for both kinds of chain and is often imperative. Proper cases improve the running of chains. You should not get good results from open gears, so why force the chain to run at a disadvantage. Silent chains have drawn the attention of automobile engineers to the advantages of chain, but why overlook the modern and highly accurate roller chain which has many uses?

"An odd number of teeth is most advisable in the small sprocket. This is not a hunting tooth but has the same effect with regard to the chain as it prevents the same combination of links coming into gear each time.

"Avoid an odd number of links where possible, as offset links, no matter how well made, are inherently weak.

"Small sprockets should be made of steel and I prefer them hardened, though this practice is not universal. For many purposes sprockets of over forty-two teeth may be made of cast iron.

"Finally, remember that, even with poor set-up, the chains hold up to their remarkably high initial efficiency until practically worn out."

Browne Reads Paper on Manifold Design

After Mr. Cautley's paper, Arthur B. Browne presented a paper on intake manifold design. In this paper it was brought out that the two important features of an intake manifold were that it should distribute the same amount of charge to each of the cylinders and that these charges should be of the same constituency. The difficulties in the way of successful manifold design have increased rather than decreased, owing to the use of the low-gravity fuel. It requires high velocity to carry the particles of fuel into the cylinders and this cannot be depended upon alone because if a minimum of 30 feet per second is necessary to keep the fuel in suspension, then the highest velocity would reach over 450 feet per second and this entails a volumetric loss of 11 per cent. A high degree of atomization combined with a geared smooth-walled intake manifold having curves of long radius is the best combination.

To Test Moline-Knight Motor 336 Hours

NEW YORK CITY, Dec. 2—An official test of the Moline-Knight motor, described in THE AUTOMOBILE of November 22, is to be conducted in the laboratory of the Automobile Club of America, beginning on or about December 15 and continuing for 2 weeks. This test will be, in a sense, the sequel to those made by the Royal Automobile Club on the Daimler-Knight engines in 1909. The two motors then tested ran continuously for 132 hours, developing an average horsepower more than 30 per cent. above their R. A. C. rating. The test to be undertaken in the A. C. A. laboratory is planned to run continuously for 336 hours, a full 14 days, and will, if completed, exceed in duration any official test of the kind ever attempted, either in this country or in Europe.

E. V. A. A. Discusses Industrial Trucks

NEW YORK CITY, Nov. 26—It was before one of the largest meetings of the Electric Vehicle Association of America ever held that W. W. White presented his paper on "The Industrial Truck as a Factor in the Efficient Handling of Internal Freight." The paper dealt with freight, baggage, and crane trucks and tractors, all electrically operated, and it was shown that the cost of handling material with these trucks was materially less than with hand trucks, and that congestion was often relieved by the increased speed due to their use.

In the discussion, the question as to the cost of operation was raised but accurate figures could not be obtained.

In THE AUTOMOBILE for November 6, it was stated that the new Oakland cars are using a semi-floating axle. The engineering department of the Oakland company requests that this statement be corrected and the word floating be substituted.

An attractive poster for the Fourteenth National Automobile Show to be held in the Grand Central Palace, New York City, January 3-10, has been selected by Manager S. A. Miles. The poster depicts a figure at the steering wheel of an automobile. The mythical gentleman is adorned with a piece of winged headgear. The Chicago automobile show will have the same design as the one used for New York

Decision for Weed Chain

Court Decides Daniel S. Gray Is Infringer of Weed Chain Patents and Takes Custody of Goods

Another Suit Is Brought Against Samuel Hollander, Morris Benjamin, H. I. Segal and Ephraim Noble

NEW YORK CITY, Dec. 2—A decision of great interest and importance has just been rendered by Judge Lacombe in one of the Parson chain grip cases, brought by the Weed Chain Tire Grip Co. against Daniel S. Gray in the U. S. District Court, Southern District of New York. On December 1, the Court ordered the sequestration and impoundment of infringing chain grips and parts for chain grips such as cross chains, cross chain hooks and tension members.

The moving papers show that the cross chains and other parts were originally owned either by the Atlas Chain Co. or by the Federal Chain & Mfg. Co. of Springfield, Mass., which succeeded the Atlas Chain Co. and that the parts in question had been enjoined while in the possession of the Atlas Co. and later while in the possession of the Federal Co. but that in violation of the injunctions the parts had been transferred and finally came to New York where they were being offered for sale by a dealer in second-hand machinery.

The complainants moved not only for an order impounding or sequestrating the goods so that they should be held awaiting the final determination of the case when presumably the complainants will ask that the goods in question be delivered up for destruction or be disposed of in some way that will effectively prevent their being used as parts of infringing devices.

Below is the opinion of the Court in full:

"The power of the Federal Courts of Equity to impound or sequestrate infringing goods and to compel their delivery up for purposes of destruction is well recognized, but it is equally well recognized that only in unusual cases will this remedy be applied. In the case in question it was shown that the parts were easily capable of being made into infringing devices and had been manufactured for that purpose and indeed that similar parts had been used by the previous owners for the manufacture of infringing grips. The difficulty of following these parts was also pointed out and it was urged by the complainants that the only effective way of preventing continued infringement by the use of these parts was that the same should be taken into the custody of the Court."

New Weed Chain Suit

NEW YORK CITY, Dec. 2—The Parsons Non-Skid Co. Ltd., and the Weed Chain Tire Grip Co. has brought suit against Samuel Hollander, Morris Benjamin, H. I. Segal and Ephraim Noble for alleged infringement on tire armors, including cross chain hooks and tension members. The complainants, who are bringing the suit before the U. S. District Court, Southern District of N. Y., claim that the defendants are offering for sale dies and other apparatus specially designed and intended for the sole purpose of enabling others to enter upon the infringing manufacturing and sale of such tire armor devices.

Acetylite and Prest-O-Lite in Court

MILWAUKEE, WIS., Dec. 2—The suit of the Prest-O-Lite Co., Indianapolis, against the Acetylite Gas Co., of Milwaukee, Percy C. Avery, et al., charging unfair competition, is now being heard in the federal court at Milwaukee by Judge A. L. Sanborn, sitting in place of Judge Ferd. A. Geiger. The Acetylite concern engaged in the production of gas tanks and refilling about 8 months ago, following the expiration of the Prest-O-Lite patents on the well known system of motor car lighting by means of storage tanks. Mr. Avery is said to be the inventor of the system and has been in litigation with the Fisher interest before this time.

File Suit Against Swinehart Company

NEW YORK CITY, Nov. 28—J. Z. Lowe, Jr., W. A. De Long and J. W. Harriman as trustee in bankruptcy of the New York Commercial Co., have brought suit against the Swinehart Tire & Rubber Co., in the United States District Court of the Southern District of New York. The suit involves an alleged breach of contract on the part of the defendents and the Cuyahoga Rubber Co. The complainants are asking for $22,362.67 with interest on $11,410 and $10,948.07.

It seems that the New York Commercial Co., entered into an agreement wherein it was agreed that this company would ship all lots of rubber which should be the subject of agreement for sale thereunder between it and the Cuyahoga company to its warehouse in Akron, O., and that the Swinehart company also entered into the same agreement.

Charges Infringement on Reliable Tire Saver

ASHLAND, O., Nov. 28—The Elite Mfg. Co., Ashland, O., has brought suit in the U. S. Circuit Court of the Northern District of Ohio, against the Ashland Mfg. Co., on charges of infringements of its Reliable tire saver, patents dated October 3, 1911, and November 4, 1913. The complainant is suing for an injunction and accounting.

Trade Mark Rights Involved in Suit

WASHINGTON, D. C., Nov. 25—What is regarded as one of the most important trade mark cases brought before the United States Court in a decade has just been docketed in that tribunal. It involves, among other things, the question of whether a territorial limit exists on a trade mark which would prevent, for instance, a miller from using his rival's trade mark in Ohio, but would not prevent him from using it in other states where the senior claimant to the trade mark did no business. The Allen & Wheeler Co. of Troy, O. complains that the Hanover Star Milling Co. of Germantown, Ill., has infringed one of its trade marks on flour. The sixth U. S. Circuit Court of Appeals held that the Ohio company's trade in this brand of flour was all north of the Ohio river, and that the Illinois corporation had built up a market for a brand under the name in Georgia, Florida, Alabama and Mississippi, not knowing that anyone else was using the same name. Under such circumstances the court held that the protection of the Ohio company's trade mark did not extend to territory where it had no trade and refused to stop the Illinois company from selling the brand in the Southeastern states.

Roland Gas-Electric Vehicle Corporation Formed To Manufacture Hexter Truck

NEW YORK CITY, Nov. 29—The Roland Gas-Electric Vehicle Corp. incorporated yesterday with a capital of $200,000, to manufacture motor trucks in this city. The incorporators are Percy K. Hexter, R. R. Conklin and Stanley L. Conklin. The company has purchased all rights to the gas-electric truck designed by Mr. Hexter ana described in THE AUTOMOBILE for October 9. Mr. Hexter will be general manager of the new company which has obtained the large building at 336-342 Avenue B, corner of Twentieth street. This was built and equipped as a modern motor truck service station, and is therefore adapted for the purpose of truck manufacturing. An output of 100 trucks will be started for the first year.

Northland Rubber Meeting Unchecked

BUFFALO, N. Y., Dec. 2—*Special Telegram*—Although Albert C. Bidwell, former president of the Northland Rubber Co., secured an injunction from Justice Woodward here in Supreme Court restraining members of the rubber firm from casting by proxy votes for stockholders unable to attend the annual meeting, he did not serve the order and the meeting progressed without interruption. An amendment to the constitution was voted for, calling for the election of nine, instead of three, directors. About 7,500 shares of stock were represented by seventy-five stockholders in attendance.

Clarke To Build Cylecars

CLEVELAND, O., Dec. 1—Robert Clarke, chief inspector of the F. B. Stearns Co., has resigned to enter the cyclecar field. Mr. Clark was superintendent in the machine shop of the Daimler Motor Car Co., and the Humber Motor Car Co., of England and also superintendent of the Columbia Motor Car Co.'s factory at Hartford, Conn.

Chamber of Commerce After Freight Cars

NEW YORK CITY, Dec. 1—With the approach of the heavy shipping season, J. S. Marvin, general traffic manager of the Automobile Chamber of Commerce, Inc., has been making an

investigation of the car situation to ascertain the railroad conditions and whether factory shipments are likely to be promptly handled by the railroads.

The records show that automobile equipment of eastern railroads at the present time is scattered all over the country and Mr. Marvin has sent a special letter to the proper officers of every railroad numbering nearly a thousand calling attention to these conditions and requesting that the cars be sent to the home roads and the factory districts.

Franklin Sales Gain 78 Per Cent.

SYRACUSE, N. Y., Nov. 29—The sale of Franklin cars for the 10 months of 1913, ending October 31, showed an increase of 76 per cent. over the same period in 1912, is the report coming from the sales department of the Franklin Automobile Co. Sales for September and October were double those for the corresponding months of 1912.

1913 Waverley Business $1,312,815

INDIANAPOLIS, IND., Dec. 2—At a meeting of stockholders of the Waverley Co. in Indianapolis a few days ago it was shown that the gross business for the last year was $1,312,815.94 and that upon a capitalization of $190,000, the company reports a capital surplus and undivided profits amounting to about $590,000. Officers and directors were elected as follows: President, William B. Cooley; vice-president, Herbert H. Rice; secretary, Wilbur C. Johnson; treasurer, William Kothe and directors: Hugh Daugherty, Joseph C. Schaf, Alexander C. Ayres and Hugh M. Love.

Not to Sell Walpole Tire Co.

BOSTON, MASS., Dec. 1—The petition of creditors, representing $900,000 of the $1,269,000 liabilities of the Walpole Tire and Rubber Co., asking that the property be sold, was denied today by Federal Judge Dodge, who said that he would take no action in the matter until the report of the receivers stated that the property could be operated at a profit.

Electric Renovator Mfg. Co. Takes Over Harroun Kerosene Carburetor

INDIANAPOLIS, IND., Dec. 1—A deal has been completed whereby the business of the Ray Harroun Co., manufacturer of kerosene carbureters, will be taken over by the Electric Renovator Mfg. Co., Pittsburg, Pa. The main plant for the manufacture of the carbureter will remain in this city, temporarily, at least. Ray Harroun is to remain with the new owner in an active capacity and will devote his efforts toward development and exploitation work toward broadening the field for the product. The Electric Renovator Mfg. Co. is to have an office in this city as well as its present offices in Pittsburg.

R. C. H. Assets Bring $295,000

DETROIT, MICH., Dec. 1—Although the entire assets of the R. C. H. Corp. were supposedly sold to the Harris Bros. Co. for $268,000 at a recent hearing before Referee in Bankruptcy, Joslyn, here, bids on November 26 were received from the Lincoln Realty Co. for the real estate and from C. L. O'Hara and W. F. Baird for the personal property which aggregated $295,000 and since the Harris concern did not care to equal this amount, the later bidders secured the property. Messrs. O'Hara and Baird will dispose of the property, guaranteeing the trustee, the Security Trust Co., $190,000 for their share, while the Lincoln Realty Co. is to pay $105,000 for the real estate. Preferred creditors, whose claims total about $270,000 and others who hold claims to the amount of $24,000 will by the liquidation realize about 60 to 75 cents on the dollar, but those who signed off their claims with a view to getting all of their money back through continuing the business and putting the concern back on its feet a year ago will lose their entire accounts amounting to $1,372,259.

Receiver for Planhard Mfg. Co.

INDIANAPOLIS, IND., Dec. 2—A voluntary petition in bankruptcy has been filed in the United States Court at Indianapolis, by the Planhard Mfg. Co., Kokomo, Ind., manufacturer of carbureters, and the court has named Charles H. Felske as receiver. The company and a majority of the creditors asked for the appointment of Felske, who has been superintendent of the plant for some time. The bankruptcy petition filed shows liabilities of $36,197.20 and assets of $3,680.02.

Tire Firms Cut Prices

Several Big Companies Give Lower Price of Crude and Effect of Tariff as Reasons for Reducing

Goodrich, Goodyear, U. S., Firestone, Swinehart, Pennsylvania, Fisk, Ajax-Grieb Among Those To Reduce

NEW YORK CITY, Dec. 3—Nearly all of the big tire concerns have come down in their prices. One of the leading tire manufacturers states that the reasons for the reduced tire prices are because of the lower price of crude; another is the threat of a foreign invasion, following the tariff reduction, and a third is the step taken by the big manufacturers to bring their prices as offered to automobile makers and those offered to tire dealers and consumers more nearly to a consistent level of equality.

The Goodyear company has come down 15 per cent. to the consumers on its plain tread tires and has also come down on its non-skid tires. Adding 17 per cent. to the prices of the plain tread tires, will give the new prices on the non-skid tires. No price list has as yet been given out to the public.

The U. S. Tire Co. has come down on the round tread tires and it is expected that it will soon reduce on the knobby tread. No price list has been published. It is understood that the U. S. Rubber Co. is working on a schedule which will call for a reduction.

The Firestone company has also met the reduction in prices and the following tables will give a comparison with those prices given out around April 1 of this year:

			Tubes	
Casing Size	Old Price	New Price	Old Price	New Price
30 x3	$13.95	$12.30	$3.35	$2.80
30 x 3.5	20.85	16.55	4.50	3.50
34 x 4	32.85	26.20	6.25	4.90
36 x 4	35.00	27.90	6.55	5.20
36 x 4.5	44.15	36.75	8.10	6.45
37 x 4.5	45.40	37.80	8.35	6.60

The above table is based on the round tread tires and the gray tubes. It will be seen that the reductions vary with the largest drops on the big tires.

The Swinehart company reports a reduction of 5 per cent. on all its tires. It has not as yet issued any list quoting the new prices.

The Michelin Tire Co. states that it will not reduce its prices. The Pennsylvania Rubber Co. will make an announcement on or about December 10 regarding its new reductions.

The Fisk Rubber Co.'s new price list is as follows, compared with that of April 1, this year, on its plain tread tires:

			Tubes	
Casing Size	Old Price	New Price	Old Price	New Price
30 x 3.5	$20.35	$17.00	$4.90	$4.00
30 x 4	29.20	21.75	6.30	5.05
32 x 4.5	40.05	32.90	8.25	6.70
36 x 4.5	45.20	37.10	9.20	7.30

Ajax-Grieb has come down about 18 per cent. on all its tires and tubes. This is the largest reduction yet made.

Promotion for Studebaker Men

DETROIT, MICH., Nov. 29—President Fish of the Studebaker Corp. announces the election of A. R. Erskine as first vice-president. Mr. Erskine retains his position as treasurer. James G. Heaslet becomes chief engineer and vice-president in charge of engineering and production; E. R. Benson, sales manager, is vice-president in charge of automobile distribution; A. L. Philp, assistant sales manager, is sales manager of the automobile division; C. D. Fleming is assistant treasurer and H. E. Dalton, is general auditor.

MINNEAPOLIS, MINN., Nov. 25—M. B. Gilman, formerly of the local branch of the Oldsmobile Co. is organizing a Minneapolis company to build the Arrow cyclecar.

NEW YORK CITY, Nov. 29—Chester S. Ricker, Indianapolis, Ind., has been appointed American representative and buyer for the United Motor Industries, Ltd., of London, Eng.

NEW YORK CITY, Nov. 29—Benjamin Briscoe, who has been abroad for the past year with his brother, Frank Briscoe, perfecting the new Briscoe car, arrived last Tuesday.

Johns-Manville Co. Takes Over Long Horn

Purchases Entire Business—No Interruption in Deliveries—Borland Electric Has New Worm Drive

NEW YORK CITY, Dec. 2—The H. W. Johns-Manville Co., of this city, has purchased the manufacturing and selling rights and stock on hand of the Long horn from its former maker, the G. Piel Co., Long Island City, N. Y. No interruption of deliveries is expected as the Johns-Manville company will immediately supply a stock of these horns to all of its forty-nine branches. The Long horn is a mechanical type, which is operated by pressing a small handle located on the back of the horn.

Bearing Makers Suggest Tolerances

NEW YORK CITY, Dec. 3—At a meeting of the Importers and Domestic Ball Bearing Manufacturers authorized representatives at the Hotel McAlpin, November 28, the following table of tolerances was approved for ball and roller bearings. This table has been submitted to the Standards Committee of the Ball and Roller Bearing Division of the S. A .E. with a recommendation for their immediate adoption to become operative after at least 6 months from the date of S. A. E. acceptance and approval, the ball bearing manufacturers to be given 6 months' notice prior to the date when these proposed tolerances shall become S. A. E. standards. A definition of eccentricity was also submitted by the ball bearing makers:

Bearing Number	Outer Race Diameter—Plus	Outer Race Diameter—Minus	Outer Race Diameter—Total	Inner Race Diameter—Plus	Inner Race Diameter—Minus	Inner Race Diameter—Total	Width for Both Races—Plus	Width for Both Races—Minus	Width for Both Races—Total
300-204	0	.0006	.0006	.0002	.0004	.0006	0	.002	.002
300-203	0	.0006	.0006	.0002	.0004	.0006	0	.002	.002
205-216	0	.0008	.0008	.0002	.0006	.0008	0	.002	.002
304-313	0	.0008	.0008	.0002	.0006	.0008	0	.002	.002
403-411	0	.0008	.0008	.0002	.0006	.0008	0	.002	.002
217-222	0	.0012	.0012	.0002	.0007	.0009	0	.002	.002
314-322	0	.0012	.0012	.0002	.0007	.0009	0	.002	.002
412-420	0	.0012	.0012	.0002	.0007	.0009	0	.002	.002

ECCENTRICITY

Bearing Number	Inner Race	Outer
200 to and inc. 208 300 to and inc. 308 400 to and inc. 408	.0008	.0012
208 to and inc. 215 308 to and inc. 315 408 to and inc. 415	.0010	.0016
215 to and inc. 222 315 to and inc. 322 415 to and inc. 420	.0012	.0018

The definition of eccentricity is as follows:

The eccentricity of the outer race is that lack of running truth shown upon a suitable indicator during the rotation of the outer race and balls upon the inner race fixed upon a stationary arbor.

Similarly—The eccentricity of the inner race is that lack of running truth noticed upon the stationary outer on rotating the inner race and balls upon true centers.

The American firms represented at the meeting were: Bantam Anti-Friction Co., Bantam, Conn.; Fafnir Ball Bearing Co., New Britain, Conn.; Gurney Ball Bearing Co., Chicago, Ill.; German-American Ball Bearing Co., Chicago, Ill.; Imperial Ball Bearing Co., Detroit, Mich.; New Departure Mfg. Co., Bristol, Conn.; Standard Roller Bearing Co., Philadelphia, Pa.; Suspension Roller Bearing Co., Sandusky, O.; and the United States Ball Bearing Co., Oak Park, Ill. The importers represented were: Barthal & Daly (Schafer bearing), New York City; R. I. V. Co. (R. I. V.), New York City; Joseph Schaeffers (H. C. B.), Cleveland, O.; J. H. Lehman Mfg. Co. (B. K. F.), New York City; Hess-Bright Co. (H. B. and D. W. F.), Philadelphia, Pa.; J. S. Bretz Co. (F. & S.), New York City; S. K. F. Ball Bearing Co. (S. K. F.), New York City; Marburg Bros. (S. R. O.), New York City; Rhineland Machine Works (Rhineland and R. B. F.), New York City, and Norma Ball Bearing Co. (Norma), New York City. A. W. Miller was chairman.

Milwaukee Motor to Resume Operations

MILWAUKEE, WIS., Dec. 1—The plant of the bankrupt Milwaukee Motor Co., which has been closed since early summer, and was purchased at receiver's sale last week by the Chicago House Wrecking Co., Chicago, for $86,000, will resume operations on January 1, 1914, according to W. J. Bennett, of St. Louis, representative of the Harris Brothers, who own the Chicago House Wrecking Co. It is the intention of the purchasers to operate the plant until it regains a profitable situation, and then dispose of it. The Harris interests will put on 100 men immediately and add more as needed.

MILWAUKEE, WIS., Dec. 3—(*Special Telegram*)—A 5 per cent. dividend was declared by the Milwaukee Motor Co. today.

Borland Electric Has New Worm Drive

CHICAGO, ILL., Dec. 2—The Borland-Grannis Co., of Chicago, maker of the Borland electric, announces the adoption of a new type of rear axle drive, known as the worm-bevel, this type having supplanted the bevel on but one other make of vehicle, the Packard, which was announced last August. The Borland worm-bevel drive resembles the Packard creation in many respects. In this type of drive the gears are constructed with their teeth skewed and at the same time curved and it is claimed that this method eliminates the backlash between the gears. In the worm-bevel one set of teeth is meshing while the set adjoining is disengaging, as against the limited contact obtained with bevels.

Automobile Securities Quotations

This week's automobile securities quotations saw few changes. There were two, however, which might be given special mention. These were the drop of 23 points of New Departure common and the rise of 107 points of Vacuum Oil stock.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	180	191	200	225
Ajax-Grieb Rubber Co., pfd	99	101	97	102
Aluminum Castings, pfd	98	100	98	101
Chalmers Motor Company, com	..	..	..	95
Chalmers Motor Company, pfd	..	..	..	96
Consolidated Rubber Tire Co., com	11	14	30	33
Consolidated Rubber Tire Co., pfd	50	60	89	95
Firestone Tire & Rubber Co., com	303	310	..	250
Firestone Tire & Rubber Co., pfd	105½	107	102	104
Garford Company, pfd	101	102	80	90
General Motors Company, com	37	38½	36	37
General Motors Company, pfd	77⅞	79½	73	74½
B. F. Goodrich Company, com	69½	70	16	16½
B. F. Goodrich Company, pfd	106½	107	77	78
Goodyear Tire & Rubber Co., com	440	445	200	210
Goodyear Tire & Rubber Co., pfd	104½	105½	93	95
Gray & Davis Co., pfd	..	..	95	100
Hayes Manufacturing Company	..	90	..	..
International Motor Co., com	17	20	..	5
International Motor Co., pfd	67	71	..	15
Kelly-Springfield Motor Truck Co., com	..	..	50	60
Kelly-Springfield Motor Truck Co., pfd	..	..	90	101
Lozier Motor Company, com	..	..	..	16
Lozier Motor Company, pfd	..	..	..	90
Maxwell Motor Co., com	..	..	2	2½
Maxwell Motor Co., 1st pfd	..	..	18½	19½
Maxwell Motor Co., 2d pfd	..	..	5½	6
Miller Rubber Company	150	153	120	130
New Departure Mfg. Co., com	..	..	145	160
New Departure Mfg. Co., pfd	..	..	100	102
Packard Motor Company, pfd	105½	106½	91	94
Palmer & Singer, pfd	..	..	..	65
Peerless Motor Company, com	..	..	15	25
Peerless Motor Company, pfd	..	..	75	85
Pope Manufacturing Company, com	27	29	..	3
Pope Manufacturing Company, pfd	70	71	10	15
Portage Rubber Co., com	..	..	..	35
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	9	9½	..	7½
Reo Motor Car Company	20	20½	..	15½
Rubber Goods Mfg. Co., pfd	105	108	100	106
Russell Motor Car Co., com	..	..	..	40
Russell Motor Car Co., pfd	..	..	..	70
Splitdorf Electric Co., pfd	..	..	40	45
Stewart-Warner Speedometer Co., com	..	..	50	55
Stewart-Warner Speedometer Co., pfd	..	..	96	97
Studebaker Company, com	41	42½	15	16
Studebaker Company, pfd	93½	94	66	69
Swinehart Tire Company	100	100½	78	80
U. S. Rubber Co., com	..	..	52½	54½
U. S. Rubber Co., 1st pfd	..	..	98½	99
Vacuum Oil Co.	..	..	191	193
White Company, pfd	105	108	104	110
Willys-Overland Co., com	..	..	60	63
Willys-Overland Co., pfd	..	..	82	88

A. A. A. Elects New Officers in First Session

John A. Wilson Is President—A. G. Batchelder, Chairman Executive Committee, H. A. Bonnell, Treasurer

RICHMOND, VA., Dec. 2—*Special Telegram*—Sixty-two accredited delegates are in attendance at the eleventh annual convention of the American Automobile Association, but despite the low attendance interest is at a high pitch. The first day's session continued from 10 o'clock until 6:30 last night and practically the entire business program for 3 days was crowded into one.

The nominating committee, scheduled to report Wednesday, brought in its recommendations yesterday afternoon, and amid enthusiasm and with unanimity the following officers were elected for the ensuing year:

John A. Wilson, of Pennsylvania, president; Dr. H. M. Rowe, of Baltimore, first vice-president; Ralph W. Smith, of Colorado, second vice-president; F. L. Baker, of Colorado, third vice-president; H. J. Clarke, of Minnesota, fourth vice-president; Preston Belvin, of Virginia, fifth vice-president; A. G. Batchelder, chairman of executive committee; H. A. Bonnell, treasurer; J. M. Brooks, secretary.

Boston Selected for 1914 Convention

President Wilson was escorted to the chair and thanked the delegates for their vote of confidence in his ability and he assured them he would be a real president and not a figurehead; that he would stand for criticism, but would not tolerate abuse. He said that the members of the American Automobile Association in undertaking the building of good roads were like men planting vineyards, they do not expect to live to enjoy the benefits thereof, but the coming generation will profit by their labors.

The new executive committee was announced as follows:

Alabama, Dr. G. J. Griel; Arizona, George Purdy Bullard; California, F. L. Baker and P. J. Walker; Colorado, Ralph W. Smith; Connecticut, F. T. Staples; Delaware, John Bancroft; Georgia, F. C. Battey; Idaho, Theo. Turner; Illinois, Allen S. Ray and Henry Paulman; Indiana, P. C. Rubush; Iowa, G. Decker French; Kansas, C. W. Barnes; Louisiana, P. M. Milner; Maine, John C. Scates; Maryland, Dr. H. M. Rowe; Massachusetts, J. P. Coghlin; Michigan, W. E. Metzger; Minnesota, Asa Paine; Missouri, Roy D. Britton and H. D. Train; Montana, L. P. Mathewson; Nebraska, Harry Lowrie; Nevada, C. G. Patrick; New Hampshire, J. A. Reynolds; New Jersey, Dr. J. M. Faulkner; New Mexico, J. S. MacTavish; New York, Dr. H. Lewis and F. S. Webb; North Dakota, S. W. Richardson; North Carolina, Col. Beneham Cameron; Ohio, Harry Gordon and Harry Vaile; Oregon, W. J. Clemens; Pennsylvania, Stedman Bent and Paul C. Wolff; Rhode Island, C. N. Doe; South Carolina, Albert S. Farmer; Texas, C. H. Verschoyle; Vermont, E. C. Smith; Virginia, Preston Belvin; Washington, A. G. Pritchard; West Virginia, Elmer Hough; Wisconsin, J. L. Drought.

Boston was selected for the meeting place of the 1914 convention.

It was said that the election of officers was brought forward to forestall an insurgent movement to elect men not connected with the "big inner ring."

Opposed to Double Tax on Automobiles

The committee on resolutions reported favorably on four resolutions. The first one expressed appreciation of the A. A. A. to Franklin K. Lane, Secretary of the Interior, and Adolph C. Miller, Assistant, for the development of the national reservations and making them easier of access to tourists; second, that the association places itself on record favoring a plan of national government participation, which shall obligate the state in return for federal attention to its most used commercial highways, to expend a proportionate amount of money on these roads which directly serve the farming community; third, favoring the measure introduced by Representative W. C. Adamson, providing that after an automobile owner has registered his car in his home state he shall be privileged to go anywhere in the United States without additional registration; fourth, placing the association on record as opposed to the registration tax on automobiles unless it shall be in lieu of all other taxes and the money thus raised be expended on road maintenance.

An article signed by Dr. Heyl, of Ohio, charging that manufacturers of automobiles and accessories supplies control the A. A. A. was declared by former President Hooper to be "an infamous lie," and the president was instructed to appoint a committee to try Dr. Heyl on a charge of treason.

The question of several state associations being in arrears to the national association for per capita tax was discussed briefly and will be considered in detail before the convention adjourns.

Motion to Teach Children Safety

RICHMOND, VA., Dec. 3—*Special Telegram*—The A. A. A. convention adjourned *sine die* this afternoon after the delegates had enjoyed a sight-seeing tour of the city. At the business session the charges of Dr. A. B. Heyl, of Cleveland, were ignored, but it is probable that the executive committee will call Dr. Heyl to answer the charges he made that the association is controlled by automobile manufacturers.

The *American Motorist*, the official organ of the association, was reported in financial straits, and the matter was referred to the executive committee for action. Additional committeemen were appointed as follows: George C. Miller, Richard Kennendell, of Pennsylvania; Fred C. Pabst, of Texas and S. A. Miles, of Maine. George C. Diehl, of New York, was re-appointed chairman of the good roads committee; Howard Longstreth, of Pennsylvania, chairman of the committee on touring; and William Schimpf, chairman of the contest board. Mr. Ventiler, of New York and Dr. Sweet, of New Jersey, were added to the executive committee. Dr. Rowe, of Baltimore, offered a motion which was adopted that the association issue educational propaganda to teach children how to avoid accident and how to care for themselves. Dr. Rowe said such instruction is now being given children in Baltimore and has been productive of much good.

Two New KisselKars for 1914

HARTFORD, WIS., Dec. 1—Coincident with the annual inventory and plant renovations of the Kissel Motor Car Co., during which both the Hartford and Milwaukee plants are closed for 2 to 3 weeks, interesting new manufacturing plans are disclosed. Early in January two entirely new KisselKar models will be offered. These will consist of a four-cylinder car at a lower figure than any KisselKar has heretofore been sold, and also a new Six, which will list for considerably less than $2,000.

Market Changes of the Week

The usual changes occurred in this week's markets. Tin again dropped, this time $0.55 per 100 pounds, closing at $38.70. There was some inquiry from the tin plate manufacturers. Beams and channels dropped $0.05 per 100 pounds. Refined copper was again lower, there being offerings abroad at concessions, but not enough business done to establish prices. American electrolytic was offered by dealers in the open market, though the demand was light and prices were nominal between $0.14 3-8 and $0.145, f.o.b. for nearby delivery. Electrolytic and Lake coppers both dropped, the former $0.00 1-4 and the latter, $0.00 3-8. Cottonseed oil gained $0.03 a barrel. The trust price of lead was reduced last week. The American Smelting & Refining Co., on Tuesday reduced the price $3 per ton. On call at the New York Metal Exchange, December and January offered at $4.10.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb....	.06⅛	.06⅛	.06⅛	.06⅛	.06⅛	.06⅛	....
Beams & Channels, 100 lbs.........	1.415	1.36½	1.36½	1.36½	1.36½	1.36½	— .05
Bessemer Steel, ton	20.00	20.00	20.00	20.00	20.00	20.00	....
Copper, Elec., lb..	.14⅝	.14⅝	.14⅝	.14⅝	.14⅜	.14⅜	+ .00¼
Copper, Lake, lb..	.15	.15	.15	.14⅝	.14⅝	.14⅝	— .00⅜
Cottonseed Oil, lb.	7.00	7.09	7.09	7.05	7.06	7.03	+ .03
Cyanide Potash, lb..........	.17	.17	.17	.17	.17	.17	....
Fish Oil, Menhaden, Brown..	.38	.38	.38	.38	.38	.38	....
Gasoline, Auto, 200 gals.......	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	....
Lard Oil, prime..	.93	.93	.93	.93	.93	.93	....
Lead, 100 lbs....	4.25	4.25	4.25½	4.20	4.20	4.10	— .15
Linseed Oil......	.48	.48	.50	.50	.50	.50	+ .02
Open-Hearth Steel, ton......	20.00	20.00	20.00	20.00	20.00	20.00	....
Petroleum, bbl., Kansas, crude..	1.03	1.03	1.03	1.03	1.03	1.03	....
Petroleum, bbl., Pa., crude.....	2.50	2.50	2.50	2.50	2.50	2.50	....
Rapeseed Oil, refined	.62	.62	.62	.62	.62	.62	....
Rubber, Fine Up-River Para.....	.74	.73	.73½	.73	.73	.73	— .01
Silk, raw Italy...	....	5.00	....	....	4.95	4.95	— .05
Silk, raw Japan..	....	4.05	....	....	3.93	3.93	— .12
Sulphuric Acid, 60 Baumé......	.90	.90	.90	.90	.90	.90	....
Tin, 100 lb.......	39.25	39.25	39.50	39.00	39.00	38.70	— .55
Tire Scrap........	.05½	.05½	.05½	.05½	.05¼	.05½	....

Propose Intercity Reliability Match

Chicago Automobile Club and Athletic Association Challenge N. Y. Athletic Club and Manhattan Automobile Club

CHICAGO, ILL., Nov. 28—A proposition to stage an intercity team match next summer between Chicago and New York took definite form last Tuesday night at the trophy dinner of the Chicago Automobile Club, held to celebrate the victory in the fall match over the Chicago Athletic Association. Both teams being represented, a direct challenge was formulated and has been sent on to New York, while a trophy for such a match has been offered by Allen S. Ray, president of the Chicago Automobile Club.

The two Chicago organizations have been participating in these team matches for the last 6 years and now aspire to bring about an intercity contest. As roughly drafted, the idea is to have the New York Athletic Club and the Manhattan Automobile Club engage in a team match in June, while the two Chicago clubs will hold a similar contest at the same time. The two winners then are to get together and it has been suggested that Buffalo would make an ideal place for this. Each team would be limited to about five cars to a side and the same interclub rules, penalizing only for work and time, could be used.

Eight Perfect in First Day of 500-Mile Run

NEW YORK CITY, Dec. 3—Of the eleven contestants, the five Buicks, the Chandler, Oldsmobile and National finished the first day of the Motor Dealers' Contest Association 500-mile reliability with perfect scores. The run was to Riverhead, L. I. Weather and roads were good. The Oakland was penalized 1 point for 1 minute's work loosening a seized brake rod, the De Dion 9 points for 9 minutes spent in cleaning dirt from the carbureter three separate times and the Hudson incurred a 6-point penalty on account of replacing the bulb in the tail light and a loose wire connection.

The pathfinder kept up a heart-breaking pace, often hitting 45 and 50 miles an hour and on the return run many of the cars indulged in bursts of speed which did much to cause damage incurring penalties. Several of the participants were arrested for speeding.

Today's run was held on Long Island. The contestants follow the north shore road to Port Jefferson, and then on to Riverhead, the noon control. The journey homeward was along the south shore. On the second day, Thursday, the tourists will invade Connecticut. New Haven will be the noon control. The run will be as far as Poughkeepsie on the third day.

A. B. Cordner, president of the Manhattan Automobile Club was appointed referee of the run. M. L. Downes will have charge of the noon controls.

None of the observers will ride in the cars for which they were nominated, but will ride in the car of other contestants. The list of entrants and observers follows:

Car No.	Make	Driver	Nominated Observer	Speed
1	Buick	E. Woodruff	C. Hanson	16
2	"	A. A. Guilford	R. H. Horner	16
3	"	C. Jones	E. J. Leahey	16
4	"	J. D. Coote	S. R. Easter	16
5	Chandler	J. M Breitenbach	E. H. Falkner	18
6	Oakland	H. E. Neely	J. Haufbauer	18
7	Oldsmobile	T. Spear	A. Schmidt	20
8	De Dion	E. Cordier	John Buschek	20
9	National	Steve Casey	R. Sellers	20
10	Hudson	R. Harmon	R. C. Rice	20
11	Buick	W. Smith	R. G. Howell	20

Four Tire Companies to Exhibit

NEW YORK CITY, Dec. 2—Through an error the Knight Tire and Rubber Co., was included in the list of tire exhibitors at both the New York and Chicago shows. It will not exhibit. The list to date is as follows: the Miller Rubber Co., Akron, O., Braender Rubber & Tire Co., New York City, Thermoid Rubber Co., Trenton, N. J. and the Overman Tire Co., Cleveland, O.

Disbrow and DePalma Star in Texas

SAN ANTONIO, TEX., Nov. 23—The first day of the postponed card of the San Antonio Auto Racing Assn. was held this afternoon, being again interrupted toward the close by rain. A fast track, though a tire-eater, was the condition. Honors were about even between Louis Disbrow in his Simplex Zip and Ralph De Palma in his Mercer, although their personal meeting in a race is yet to be staged. Chandler showed the best form of the others, with George Mason, Gus Monckmeier, Bill Endicott, John Raimey and one or two others displaying form. Two bad spills in which George Mason and E. V. Rickenbacher escaped unhurt, the former after his car had gone over the bank and the latter after his car had turned over and pinned him under it, were thrills of the program, which was witnessed by a big crowd. The manner in which Disbrow and Raimey handled their cars to avoid the great central track wear on their tires in the longer events was a feature. They hugged the pole throughout, the going being a bit softer there.

Mile Time Trials

CAR	DRIVER	TIME
Simplex	Disbrow	53:
Staver	Monckmeier	
Case	Endicott	
Mason	Rickenbacher	

Class E, 300 Cu. In.

CAR	DRIVER	TIME
Mason	Chandler	6:50
Mason	Mason	
Case	Ulbricht	

Class C, 301 to 450 Cu. In.

CAR	DRIVER	TIME
Mercer	DePalma	8:33 1/5
Mason	Mason	
Case	Raimey	

Class C, 451 to 600 Cu. In.

CAR	DRIVER	TIME
Simplex	Disbrow	11:29
Staver	Monckmeier	
Case	Endicott	

Exhibition 1½ Mile

CAR	DRIVER	TIME
Jay Eye See	Disbrow	1:24 3/5

New York Fines 365 Speeders

NEW YORK CITY, Dec. 2—Three hundred and sixty-five speeders faced the bar of justice in various police courts yesterday and paid close to $5,000 in fines. The fines averaged about $50 apiece. Practically every City Magistrate in Manhattan and the Bronx stepped into the crusade against speeding and reckless automobilists yesterday and imposed heavy penalties upon the persons caught during the spectacular police activity in the most used thoroughfares of the city Saturday and Sunday.

In the long list of prisoners who paid fines were many persons residing outside the city. Bob Burman, the racing driver was fined $25 for operating his automobile at 25 miles an hour. Magistrate Deuel rendered a decision holding guilty a driver of an automobile mail truck accused of reckless driving and fined him $25. He declared that no class of vehicles is exempt from speed ordinances.

Many of the $50 fines were for first offenses. Magistrate Krotel stated: "I imposed $50 today on first offenders, a departure from the custom. It would be my policy to impose a fine of $75 tomorrow, $100 the day following, and then a workhouse sentence. We must meet this speeding question squarely."

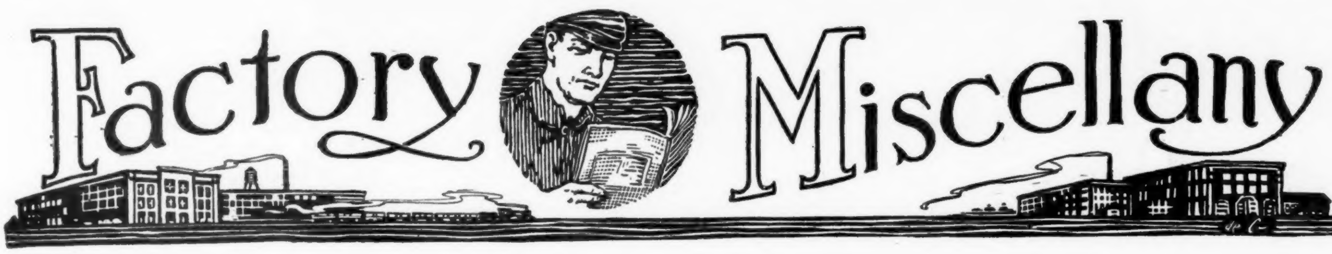
Mitchell in 2,563-Mile Non-Stop Run

PITTSBURGH, PA., Nov. 29—The Williams-Hasley Motor Car Co., agent for the Mitchell, this evening brought to a successful completion a non-motor-stop test of a Mitchell light six which started at 12:35 p. m. last Monday and which ran until this evening, completing in that time a journey of 2,563 miles. In support of its contention the company offers affidavits of officials bearing out its claims.

The run was conducted over the city streets of Pittsburgh and on the roads within 200 miles of the city. The first 10 centuries were completed at 12 o'clock noon, November 26, when the odometer showed 1,005 miles. This was the mark the car started out to reach but at that time it was running so well that the Pittsburgh agents decided to continue the test until Saturday night when a big banquet in celebration of the run was scheduled. W. G. Hasley was the driver to start the affair and he was assisted throughout the run by Frank Zerbies from the factory.

Speedwell Has 135-Inch Wheelbase

A typographical error in the description of the new Speedwell car appearing on pages 1018 and 1019 of THE AUTOMOBILE for November 27 occurs in stating that the wheelbase of this car is 125 inches, whereas it is 135.



COLDBROOKE Important Industrial Suburb—The prospect of developing at Coldbrooke, N. B., an important industrial suburb within 3 miles of St. John grows steadily brighter. The Maritime M. C. Co. has a factory there for the manufacture of the Maritime Singer, and it is announced that a new factory will be completed in the spring. The Ford Motor Co., Detroit, Mich., will also establish at Coldbrooke an assembling plant and service station, which means a great extension to the business. J. A. Pugsley and Malcolm Mackay, Jr., have gone to England to carry on further negotiations with English concerns, and it is expected the result will be the establishment of a factory at Coldbrooke for the manufacture of motor trucks.

Moves to Dunkirk—The Motor & Mfg. Wks. Co. has removed to its new factory, 21,218 East Second street, Dunkirk, N. Y.

New Body Factory—The Alloway-Martin Co., Cleveland, O., has awarded a contract for the construction of a new four-story factory for the manufacture of automobile bodies.

Keeton Plant Additions—Additions are to be made to the plant of the Keeton Motor Co., Detroit, Mich., within a short time, to enable the company to take care of the enlarged output.

Crown Will Move to Hamilton—The Crown M. C. Co., which manufactures the Crown 30 and which has been located at Louisville, Ky., is arranging to remove its plant to Hamilton, O.

Heinz Electric Installing Machinery—The Heinz Electric Co., Ltd., an outgrowth of the Heinz Electric Co., Lowell, Mass., is installing its machinery in the new plant at Walkerville, and manufacturing of the Heinz spark coils for the Canadian market will start in two weeks.

Homers Motors Erects—The Homers Motors Co., Los Angeles, Cal., is erecting a factory at San Fernando Road and Anvia street for the manufacture of motors and for the construction of heavy tractors and light delivery wagons. A foundry, and machine shop will be included.

Panama Rubber Improvements—The Panama Rubber Co., Los Angeles, Cal., has prepared plans for the erection of a plant with capacity to manufacture 200 automobile tires daily. Ground has been broken for the main building, which will be a one-story building of reinforced concrete construction.

Rex Plant in Detroit—The Rex Motor Co., recently incorporated, with C. H. Blomstrom, W. H. Frazier, Albert Robinson and Frank Lemories as stockholders, will move its factory now located on Junction avenue, Detroit, Mich., to a new plant being constructed on West Jefferson avenue, near the River Rouge.

Johnson Economizer's Canadian Plant—The H. B. Johnson Economizer Co., Philadelphia, Pa., is contemplating the establishment of a large factory in Canada. Court Shaw, sales manager, is making arrangements for the location of a factory to handle Canadian business, either in Toronto or Montreal.

The Automobile Calendar

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Shows, Conventions, Etc.

Dec. 6-13	Toledo, O., Annual Show, Factories Bldg., Toledo Auto Shows Co.
Dec. 9-13	Philadelphia, Pa., Annual Convention of American Road Builders' Association.
Dec. 11-20	New York City, First International Exposition of Safety and Sanitation, under the auspices of the American Museum of Safety.
Dec. 17-20	Davenport, Ia., Annual Show, Armory Hall, Tri-City Auto Dealers' Assn.
Jan. 2-10	New York City, Importers' Automobile Show, Hotel Astor.
Jan. 3-10	New York City, Automobile Show, Grand Central Palace.
Jan 10-16	Milwaukee, Wis., Sixth Annual Show, Auditorium, Milwaukee Automobile Dealers' Assn.
Jan. 10-17	Cleveland, O., Automobile Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 10-17	Philadelphia, Pa., Show, Metropolitan Building, Automobile Trade Assn., H. W. Terry, Secretary.
Jan. 12-17	Bridgeport, Conn., Annual Automobile Show, State Armory, B. B. Steiber, manager.
Jan. 17-24	Pittsburgh, Pa., Annual Automobile Show, Automobile Dealers' Assn.
Jan. 24-31	Montreal, Que., Automobile Show, Passenger Cars, Montreal Automobile Trade Assn.
Jan. 24-31	Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan. 26-31, 1914	Scranton, Pa., Automobile Show, Automobile Assn. of Scranton.
Jan. 31-Feb. 7	Minneapolis, Minn., Automobile Show.
Feb.	Hartford, Conn., Show.
Feb.	St. Louis, Mo., Show.
Feb. 2-7	Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Assn.
Feb. 3-7	Montreal, Que., Motor Truck Show, Montreal Automobile Trade Assn.
Feb. 4-7	St. Joseph, Mo., Annual Show, St. Joseph Auditorium, St. Joseph Automobile Show Assn.
Feb. 7-12	Seattle, Wash., Annual Automobile Show, State Armory Bldg., W. I. Fitzgerald, Manager.
Feb. 9-14	Grand Rapids, Mich., Fifth Annual Western Michigan Show, Klingman Furniture Exposition Bldg., *Grand Rapids Herald*.
Feb. 9-14	Buffalo, N. Y., Truck Show, Buffalo Automobile Dealers' Assn.
Feb. 16-21	Kansas City, Mo., Auto Show.
Feb. 21-28	Newark, N. J. Automobile Show, N. J., Auto Trade Assn.
Feb. 21-28	Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Feb. 23-28	Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Mar. 2-4	Cincinnati, O., Commercial Vehicle Show, Cincinnati Automobile Dealers' Assn.
Mar. 2-6	Fort Dodge, Ia., Show, Fort Dodge Auto Dealers' Assn.
Mar. 7-14	Boston, Mass., Automobile Show.
Mar. 9-14	Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
March 17-21	Boston, Mass., Truck Show.

Ohio Falls Plant Not Sold—The plant of the Ohio Falls Motor Co., New Albany, Ind., which was recently offered for sale by Joseph Burns, receiver, failed to attract a bidder. According to the decree of the court the plant must sell at $40,000, the purchaser to pay $15,000 and assume liens aggregating $25,000. The result of the sale will be reported by Mr. Burns to Judge Utz in the Circuit Court, when it will be determined whether a reappraisement of the property will be made.

Monaca's Gibson Automobile Factory—The Gibson M. C. Co. has concluded negotiations for the purchase of the buildings of the Pittsburgh Tube and Steel Co., at Monaca, Pa., and is having the plant remodeled for the manufacture of automobiles. The main building of the works is 150 by 200 feet and the equipment includes a gas engine-driven power plant of 75 horsepower. Machine tools and equipment is being purchased with the expectation of putting the plant in operation during the present month.

Firestone Additions Progressing—Two additional wings to the factory of the Firestone Tire & Rubber Co., Akron, O., which will permit a 40 per cent. increase in the output, are rapidly nearing completion and probably will be ready for occupancy early in the spring. Like the rest of the building the new wings are of steel and concrete, with a facing of light brick, and are absolutely fireproof. The tire plant of the company moved into its present quarters two years ago. An addition was necessary before the factory was a year old. Before that was finished the wings now in course of construction were begun. Offices of the company now take up the top floors of two wings. More space is needed, however, and when the additions are complete another entire floor will be given over to offices.

Additions at Ford Factory—An addition will be made to the heat treating building of the Ford Motor Co., at Ford, Ont. It will be doubled in size. Practically all steel wearing parts in the Ford are of Ford vanadium steel, which is a special metal; an alloy being mixed with the steel in melting. However, an additional process to complete this metal is necessary, and it is this that is carried off in the heat treatment building of the Ford plant. The present building is 35 feet wide and 135 feet long, the new one will be 70 feet wide and 270 feet long. The present employs 50 men, the new one will ultimately employ the same number. In the new building will be installed six new furnaces. Electrically controlled thermometers will control the heat of these furnaces, according to scientific Ford formulæ. The fuel will be natural gas supplied from the fields of Tilbury, 40 miles away.

The Week in the Industry

Motor Men in New Roles

BAYNE Resigns from Timken—C. W. Bayne, efficiency man and cost expert at the Timken-Detroit Axle Co., Detroit, Mich., has tendered his resignation, effective on January 1, when he will embark in business for himself. He was connected with the International Harvester Co. and Pullman Car Co. before joining the staff at the Timken Co.

Krueger Joins Tiffany—C. F. Krueger, vice-president of the Standard Electric Car Co., Jackson, Mich., has joined the Tiffany Electric Car Co., Pontiac, Mich.

Bowler Apple Advertising Manager—G. H. Bowler is again in the automobile industry, having become sales and advertising manager of the Apple Electric Co., Dayton, O.

Fulton Off on Trip—S. A. Fulton, president of the Fulton Co., Milwaukee, Wis., departed recently for an extended Western trip, in the interests of the Aermore exhaust horn.

Cameron in New Capacity—W. E. Cameron, previously Western sales manager for the Motz Tire & Rubber Co., Akron, O., has been appointed assistant sales manager.

Taylor Hess General Manager—W. P. Taylor has become general manager of the Hess Spring & Axle Co., Carthage, O. He was formerly connected with the Lewis Spring & Axle Co.

Brinker Motz Manager—R. O. Brinker, previously branch manager for the Motz Tire & Rubber Co., at Washington, D. C., is now manager of the commercial tire department.

McCaughey Elected President—W. F. McCaughey, vice-president of the Racine Mfg. Co., motor car body builder, Racine, Wis., was elected president of the Racine Commercial Club.

Hewes Visits Cole Agencies—C. L. Hewes, sales manager of the Pacific M. C. Co., San Francisco, Cal., has returned from a visit to the Cole agencies throughout Northern California.

Warner with Detroit Standard Gear—H. L. Warner, formerly of Muncie, Ind., has become affiliated with the Detroit Standard Gear Co., Detroit, Mich., successor to the Standard Gear Co.

Russell with Bessemer—R. F. Russell, formerly assistant chief engineer of the Alco plant, has taken charge of the engineering department of the Bessemer Motor Truck Co., Grove City, Pa.

Haltenberger Back from Europe—Jules Haltenberger, of the engineering department, of the Lyons-Atlas Co., Indianapolis, Ind., has just returned to America after an extensive trip through Europe.

Hardwell Leaves Grinnell—O. R. Hardwell, sales and advertising manager of the Grinnell Electric Car Co., Detroit, Mich., has resigned to become business manager of the magazine Business published in Detroit.

Berger Returns from Europe—F. H. Berger returned from Europe last week. He visited the Paris and London shows, and also a number of the foreign factories in the interests of the Oakland Motor Car Co., Pontiac, Mich.

Waterman Resigns—H. A. Waterman, general superintendent of the Milwaukee, Wis., works of the International Harvester Co., has resigned to become general manager of operations for the M. Rumely Co., Laporte, Ind.

Doolittle Starts New Business—A. H. Doolittle, former advertising manager of the Continental Motor Mfg. Co., has resigned that position to become advertising manager and counsel for several Detroit concerns on a part time basis.

Gifford with Int. Harvester—E. A. Gifford, for nearly 4 years with the Peerless M. C. Co. as designer, has taken a position with the International Harvester Co., Akron, O., as chief draughtsman of the automobile department.

Longtin Resigns from Knox—A. L. Longtin, who for the past eleven years has been in the employ of the Knox Automobile Co., Springfield, Mass., as assistant superintendent, and latterly as manager of production and cost, has resigned.

Tucker on Maxwell Trip—F. E. Tucker, formerly manager of the Holt-Chandler Co., New York City, is on a Southern mission for the Maxwell Motor Co., Detroit, Mich. For the time being he is making his headquarters at Atlanta, Ga.

McGlashan Makes Studebaker Change—William McGlashan, who has been the electric truck engineer at the Studebaker South Bend factory, has been transferred to the Detroit plant of the corporation. He will act there in the capacity of pleasure car engineer.

Redden Goes West—C. F. Redden, general sales manager for the Maxwell Motor Co., Detroit, Mich., started this week for New York City for a trip of several weeks among Maxwell agencies. He will first go South, and then will swing west from Dallas, Tex., to the Pacific Coast, returning to Detroit just before Christmas.

Mansbach Off for Europe—Louis Mansbach, treasurer of the Times Square Automobile Co., New York City and Chicago, Ill., left on December 3 to visit the various agents throughout the Continent handling their automobiles and automobile accessories. He will also establish agencies throughout England, France, Germany, Italy, etc.

Garage and Dealers' Field

Gets New Shock Absorber—The Rhineland Machine Works, Detroit, Mich., has secured the agency for the A. V. shock absorber.

Oakland Supply Co. Moves—The Jones Auto Supply Co., Oakland, Cal., has moved to the northwest corner of Twenty-fifth street and Broadway, that city.

Firestone's New Seattle Home—The Firestone Tire and Rubber Co. announces that the construction will shortly commence on its new home in Seattle, Wash. Plans call for a building with approximately 20,000 feet of floor space.

New Gasoline Economizer Agent—The Vesta Storage Battery Co., manufacturer of batteries and electric lamps at 1718 Broadway, New York City, has become an agent for the Empire gasoline economizer in this state and New Jersey.

New Marmon Book Issued—An interesting and attractive book just issued by the Nordyke & Marmon Co., Indianapolis, Ind., is called "The Marmon Forty Eight in Service." This book is a decided innovation in the field of automobile literature.

New Bus Line—The Springfield & Washington Traction Co. has inaugurated an auto-bus service between Jeffersonville and South Charleston, O., as an adjunct to the electric line. On its first round trip the automobile carried 107 passengers.

Federal Tire's Frisco Building—The Federal Rubber Mfg. Co., Milwaukee, Wis., has announced the closing of a contract for a new Pacific Coast branch building on the corner of Van Ness avenue and Sutter street, San Francisco, Cal., the building to be completed by

New Steel Firm for Indianapolis—Representatives of the Bismarck Steel Works, Berlin, Germany, have been in Indianapolis, Ind. investigating the feasibility of establishing a distributing station in that city. It is understood that their investigation was satisfactory. Karl Schneider, a director of the company, and Frank Wallace of New York, an American representative, visited Indianapolis. Until recently the tariff on the company's products has been so high as to preclude exporting it to the United States on a large scale. It is regarded as likely that a station for the distribution of the company's products, particularly nickel, will be established in Indianapolis about the first of the year.

New Stewart-Warner Agencies—The Stewart-Warner Speedometer Corporation, Chicago, Ill., has established the following agencies: 174 Columbus Ave., Boston, Mass.; 724 Main street, Buffalo, N. Y.; 1312 Michigan avenue, Chicago, Ill.; 1831 Euclid avenue, Cleveland, O.; 1235 Woodward avenue, Detroit, Mich.; 514 N. Capitol avenue, Indianapolis, Ind.; 233 West Fifty-eighth street, New York City; 1447 Van Ness avenue, San Francisco, Cal.; 3333 Olive street, St. Louis, Mo.; 608 North Broad street, Philadelphia, Pa.; 1825 Grand avenue, Kansas City, Mo.; 301 North Craig street, Pittsburg, Pa.; 115 East Tenth street, Los Angeles, Cal.; 300 Peach street, Atlanta, Ga., and 335 Third avenue, S., Minneapolis, Minn.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BROCKTON, MASS.—White Automobile Co.; capital, $30,000. Incorporators: R. Litchfield, Samuel H. Freedman, Pauline H. Simons.

BROOKLYN, N. Y.—Aero Motor Vehicle Corpn., capital, $10,000. Incorporators: Albert E. Parke, E. W. Helin, Herbert Lovinger.

BRYAN, TEX.—Brazos Valley Ford Co.; capital, $3,500; to buy and sell automobiles. Incorporators: M. R. Newnham, H. O. Boatright, Ben M. Barker.

BUFFALO, N. Y.—Motor Carette Co.; capital, $30,000; to do a general automobile business. Incorporators: H. J. Cardigan, C. J. Kerm, A. M. Pearsall.

CAMBRIDGE, MASS.—Myer Abrams Co.; capital, $50,000; automobiles, etc. Incorporators: David Abrams.

CLEVELAND, O.—F. J. Allen Co.; capital, $5,000; to sell automobiles and sundries. Incorporators: F. J. Allen, R. M. Schrad, Chas. A. Aaron, M. F. McFadden, W. M. Byrnes.

CLEVELAND, O.—Foster-Birdsall Motor Car Co.; capital, $10,000; to buy, sell and deal in automobiles. Incorporators: C. R. Foster, F. W. Frey, J. G. Weil, W. H. Birdsall, E. J. Burdick.

KEARNY, N. J.—Arlington Motor Car Co.; capital, $100,000; to do a general automobile business. Incorporators: S. R. Bowley, J. R. O'Connor.

NEW YORK, N. Y.—Broadway Auto Sales Co., Inc.; capital, $2,000. Incorporators: B. F. Thomas, R. G. Randolph, Louise E. Jeter.

NORWOOD, O.—H. M. Kinsman Co.; capital, $20,000; to do a general automobile and accessories business. Incorporators: H. M. Kinsman, H. L. Farmer, E. E. Wright.

NEWCASTLE, O.—Goodwin-Gallivan Motor Co.; capital, $10,000; retail automobiles. Incorporators: William M. Goodwin, John C. Goodwin, James P. Gallivan.

NEW YORK, N. Y.—Paige-Detroit Co. of New York; capital, $50,000; to manufacture motors, machinery, etc. Incorporators: E. M. Dalley, S. J. Wise, F. W. Kolb.

NEW YORK, N. Y.—Roland Gas Electric Vehicle Corpn.; capital, $200,000; to do a general automobile business. Incorporators: Percy K. Hexter, Roland R. Conklin.

PITTSBURGH, PA.—Vulcan Motor Truck & Service Co.; capital, $25,000. Incorporators: D. O. Jones, G. S. Hartley, T. F. Kennelly.

ROCHESTER, N. Y.—H. L. F. Trebert Rotary Motor Co.; capital, $150,000. Incorporators: H. L. F. Trebert, Martin J. Shrag, L. G. Ogden.

ROCHESTER, N. Y.—Housel Mfg. Co.; capital, $25,000; to manufacture automobiles. Incorporators: William H. Cole, William E. Housel, B. B. House.

SAN FRANCISCO, CAL.—Kleiber & Co.; capital, $250,000; to manufacture motor trucks. Incorporator: Paul Kleiber.

SYRACUSE, N. Y.—Sagamore Motors Corp.; capital, $75,000. Incorporators: Julian S. Brown, Chas. G. Hanna, Ernest W. Lawton.

WILMINGTON, DEL.—Maxwell Motor Sales Corp.; capital, $10,000. Incorporators: Norris W. Brown.

WILMINGTON, DEL.—Moore Motor Truck Co.; capital, $300,000. Incorporators: Chas. B. Bishop, Clarence J. Jacobs, Harry W. Davis.

GARAGES AND ACCESSORIES

BIRMINGHAM, ALA.—Airless Tire Filler Co.; capital, $2,000. Incorporators: J. E. Smith, W. E. Oldham.

BROOKLYN, N. Y.—De Luxe Garage Co., Inc.; capital, $5,000. Incorporators: Frank Staeudel, Katherine Staeudel, Harry B. Potter.

CHARLESTON, W. VA.—Tri-State Motor Car Co.; capital, $10,000; to do a general garage business. Incorporators: Louis P. Frobe, G. E. Griffin, Morris Jacobs, S. K. Johnson, Thos. Halpin.

CLEVELAND, O.—Knight Motor Repair & Garage Co.; capital, $5,000; to do repair work of all kinds. Incorporators: Arthur House, Frank R. Kyle, Frank X. Schaut, Carey L. Allen, Walter H. Buckins.

CANISTEO, N. Y.—Automobile Machine Co.; capital, $500; to manufacture springs and other parts for automobiles. Incorporators: Chas. B. Schaumberg, Jos. L. Schaumberg, Wm. F. McGreevy, Chas. L. Thomas.

INDIANAPOLIS, IND.—National Automobile Equipment Co.; capital, $10,000; to manufacture electrical and mechanical devices for automobiles. Incorporators: N. Burnham, J. A. Martz, G. B. Martz.

LANSING, MICH.—Detroit, Barton Auto Top Co.; capital, $10,000; to manufacture automobile accessories. Incorporators: Albert Barton, Geo. S. Field, Ida M. Willis.

LIMA, O.—Lima Motor Transit Co.; capital $10,000; to operate a motor bus line. Incorporators: W. S. Pierce, Fred W. Cook, W. B. Berryman, R. B. Davis.

NEW YORK, N. Y.—United Auto Rim Co.; capital, $50,000. Incorporators: Christian W. Schildwachter, August Linden, Philip S. Smith.

SPOKANE, WASH.—Ferguson Auto Springs Mfg. Co.; capital, $1,000,000. Incorporators: A. B. Ferguson, F. W. Stephans.

ST. LOUIS, MO.—Motor Storage Co.; capital, $250,000; to do a storage business. Incorporators: Henry B. Graham, Nelson S. Gotshall, W. J. Holbrook.

ST. LOUIS, MO.—Vaught Inspection & Service Bureau; to inspect automobiles. Incorporators: C. C. Vaughn, E. J. Dykstra, W. F. Horsting.

CHANGES OF NAME AND CAPITAL

ANDERSON, IND.—Buckeye Mfg. Co.; capital increased $100,000.

INDIANAPOLIS, IND.—Motor Car Mfg. Co.; capital increased from $150,000 to $160,000.

JOPLIN, MO.—Independent Rubber Co.; capital decreased from $10,000 to $5,000.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Austin, Tex.	Moon	Abadie Garage Co.
Bangor, Me.	Franklin	Edwin O. Hall.
Bartlesville, Okla.	Moon	Cherokee Motor Co.
Boston, Mass.	Westcott	John W. Harding.
Brockton, Mass.	Oakland	Gay Auto Co.
Buffalo Center, Ia.	Oakland	J. F. Buggy.
Cameron, Mo.	Oakland	R. H. Holloway.
Celeste, Tex.	Oakland	Whittemore & Hutton.
Clay Center, Kans.	Oakland	I. R. Watts.
Cleburne, Tex.	Oakland	Corson Auto Co.
Coleman, Tex.	Oakland	W. A. Gray.
Colorado, Tex.	Oakland	W. J. Phoenix.
Columbus, O.	Partin-Palmer	Partin-Palmer Columbus Co.
Colville, Wash.	Reo	Willett Bros.
Corsicana, Tex.	Oakland	Warren & Urban.
Corvallis, Ore.	Oakland	Meyers Auto Co.
Decatur, Ill.	Oakland	W. L. Shellabarger & Sons.
Delaware, O.	Regal	Griffith & Cone.
Dover, Me.	Oakland	W. H. Case.
E. Haverhill, N. H.	Oakland	D. H. Gannett.
Fall River, Mass.	Oakland	F. L. Levin.
Fort Fairfield, Me.	Oakland	Hopkins Bros.
Garden City, Tex.	Oakland	E. T. Cobb.
Glasgow, Ky.	Studebaker	Glasgow Motor Car Co.
Grants Pass, Ore.	Oakland	I. H. Williams.
Great Falls, Mont.	Chalmers	Prentice Auto Co.
Green Camp, O.	Regal	R. C. McClelland.
Greenleaf, Kans.	Ford	Van Valkenburg & Co.
Greenleaf, Kans.	Krit	Van Valkenburg & Co.
Greensburg, Ind.	Oakland	Oakland Sales Co.
Greenville, Tex.	Oakland	S. R. McWhirter.
Grove City, O.	Regal	Ed. Emelhainze.
Henry, Ill.	Moon	J. E. Berry.
Henderson, Tex.	Oakland	Lacey Hightower.
Hillsdale, Ind.	Oakland	Edw. Jackson.
Hillsboro, Tex.	Oakland	Newton & Porter.
Holyoke, Mass.	Oakland	Dunbar Motor Co.
Honey Grove, Tex.	Oakland	W. L. Dial.
Hudson, Wis.	Overland	Hudson Garage Co.
Indianapolis, Ind.	Haynes	Harry Archey.
Island City, Ore.	Oakland	J. J. Quinland.
Kemp, Tex.	Oakland	H. W. Haynie.
Lampasas, Tex.	Oakland	Lampasas Auto Co.
Lebanon, Ky.	Studebaker	T. M. Estes.
Lena, Ill.	Franklin	Dan Van Matre.
Lexington, Ky.	Franklin	Phoenix Motor Car Co.
Lexington, Ky.	Oakland	Thos. Dewhurst.
London, O.	Regal	O. A. Hicks.
Los Angeles, Cal.	Partin-Palmer	Golden State Motor Car Co.
Ludlow, Vt.	Oakland	E. C. Warner.
Marietta, O.	Studebaker	Court Motor Car Co.
Marion, O.	Cole	Gunder & Miller.
Marshall, Tex.	Oakland	L. S. Hawley.
Mart, Tex.	Oakland	J. L. Vaughn.
Mason, Tex.	Oakland	Lagle Auto Co.
Mathis, Tex.	Moon	C. C. Braden.
Mattapan, Mass.	Oakland	Mattapan Motor Car Co.
Meredith, N. H.	Oakland	L. G. Pynn & Co.
Middleport, O.	Oakland	Forrest & Williamson.
Millersburg, O.	Oakland	Frank Pyers.
Minneapolis, Minn.	Empire	Stimson Automobile Co.
Minneapolis, Minn.	Meteor	MacArthur-Thompson-Zollars Co.
Montreal, Que.	Case	Gadbois, Ltd.
Montreal, Que.	Jack Rabbit	Auto & Garage Co., Ltd.
Montreal, Que.	Maxwell	Auto & Garage Co., Ltd.
Montreal, Que.	Oakland	Leger & St. Pierre.
Montreal, Que.	Palmer-Singer	Gadbois, Ltd.
Montreal, Que.	Partin Palmer	Leger & St. Pierre.
Munfordville, Ky.	Studebaker	C. A. Dawson.
Nashville, Wis.	Buick	F. J. Rogers.
Nashville, Wis.	Henderson	F. J. Rogers.
Newport, N. H.	Oakland	N. Geoffrion.
Newton, Kans.	Oakland	P. A. Martens.
Newport, Wash.	Reo	Lutz V. Jones.
Norwich, Conn.	Oakland	F. E. & E. L. Pattison.
Olathe, Kans.	Oakland	R. C. Fay.
Palouse, Wash.	Reo	Palous Hardware & Implement Co.
Pawuska, Okla.	Oakland	Easterbrook & Stephens.
Phoenix, Ariz.	Maxwell	W. D. Tremaine.
Phoenix, Ariz.	Oakland	A. G. Woodill.
Phoenix, Ariz.	Paige-Detroit	A. W. Newton.
Piqua, O.	Regal	C. R. Alexander.
Portland, Ore.	Stewart	H. L. Keats Auto Co.
Prosper, Tex.	Oakland	A. P. Mahard.
Providence, R. I.	Oakland	P. A. Clark.
Providence, R. I.	Krit	Whitten Motor Vehicle Co.
Saco, Me.	Oakland	R. D. Milliken.
Salem, Ore.	Oakland	Reis & Elgin.
Sharon, Pa.	Franklin	Chas. H. Wiltsie.
Sonora, Tex.	Oakland	W. L. Aldwell.
St. Albans, Vt.	Oakland	H. W. Ballard.
Stephenville, Tex.	Oakland	John Cage.
Taylor, Tex.	Moon	Pruitt Auto Co.
Teague, Tex.	Oakland	L. R. Boyd.
Tempe, Ariz.	Studebaker	S. Z. Earle.
Tiffin, O.	Buick	Harding & Harding.
Toledo, O.	Krit	Cornelius-Hehly Auto Co.
Topeka, Kans.	Oakland	J. R. Johnson.
Trent, Tex.	Oakland	R. H. Reaves.
Troy, Kans.	Oakland	Yates & Minter.
Uniontown, Wash.	Reo	J. J. Wells Hardware Co.
Utica, N. Y.	Franklin	W. W. Garabrant.
Waco, Tex.	Oakland	Clem Bagwell.
Watch Hill, R. I.	Oakland	F. O. Lamphear & Co.
Waukesha, Wis.	Ford	Spring City Auto Co.
Weatherford, Tex.	Oakland	Mark Putnam.

COMMERCIAL VEHICLES

Place	Car	Agent
Akron, O.	Stewart	Main Street Garage.
Columbus, O.	Stewart	F. E. Avery & Son.
Omaha, Nebr.	Stewart	Andrew Murphy & Son.
Syracuse, N. Y.	Stewart	Stowell Motor Car Co.

ELECTRIC VEHICLES

Place	Car	Agent
St. Louis, Mo.	Van Auken	Rauch & Lang.
Vancouver, B. C.	Ohio	Vancouver Ohio Electric Car Co.

Accessories for the Automobilist

VALENTINE Differential—The feature of the Valentine differential is that no gears are employed. Differential action being secured by allowing the outer wheel to run free while the inner one does the driving. This is accomplished by using roller ratchet clutches in the differential casing. When both wheels are traveling at the same speed both clutches are engaged, but when one wheel runs faster its clutch automatically drops out of engagement and driving is then effected through the slower wheel. This differential is made in two types, designated as A and B, the former being made in various sizes for cycle cars, passenger cars and light trucks and the latter for heavy commercial vehicles. The heavy type will be described first. The action of the differential is most easily explained by tracing the driving effort from the big bevel gear to the axle shafts. Looking at Fig. 1, it is seen that this gear drives the housing A, which is divided into two parts by the wall B. On each side of this wall are four cam-like projections C, Figs. 1 and 2, operating the rollers E, which force the clutch shoes H into frictional engagement with the drum D, the halves of the drum transmitting the drive to the axles. When one wheel runs faster, the tendency of the cam C to hold the shoes against the clutch drum is removed and the clutch automatically drops out of engagement. Type A, Fig. 3 is similar in design and operation to its larger brother, drive between the cam C and the housing D being frictionally obtained by the jamming of the rollers E between the two members C and D. The cage F keeps the rollers properly spaced and shifting pins G limit the motion of the cage. It is claimed that the differential comes into action before the wheels slip 1 inch. Self starter and electric generator clutches operating on the same principle are also made by the inventor John Valentine, 236 South La Salle St., Chicago, Ill.

Avery Roll Top—Something entirely new in top design has been brought out by the Automobile Roll Top Co., Milwaukee, Wis., and as its name suggests this top rolls up when not in use instead of folding back into place. At A, Fig. 5, the top is shown extended; it being supported, when in this position, by bow rods which telescope out of sight when the top is down, as illustrated at B. This top can be easily operated by one person. The advantages claimed for it are that no slip covers are required, there are no bows to rattle nor straps to buckle, body ironing is simplified and the top fabric is kept in good condition because it is thoroughly protected by the metal cylinder. The tops are furnished to top makers or automobile manufacturers either complete or with metal parts alone.

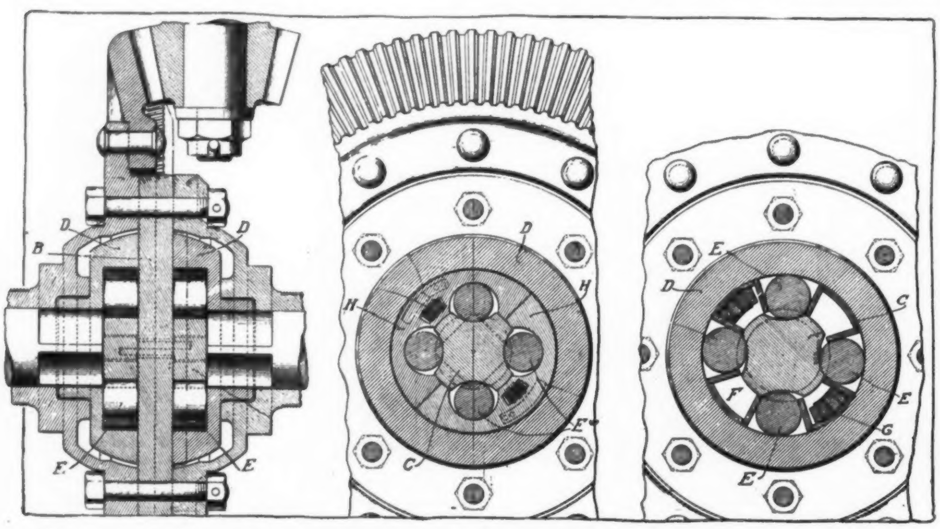
Vixen File Sharpener—Heretofore it has been customary to scrap dull files, although all the other tools used in the shop are sharpened again and again, but now the Vixen Tool Co., Philadelphia, proposes to reduce the expense of continually buying new files by means of a file resharpening machine, Fig. 4. This machine is made possible because Vixen files are made by cutting each tooth separately on a milling machine. Resharpening is accomplished in a similar machine in which the milling cutter is replaced by a small emery wheel. The operator swings the emery wheel back and forth through each tooth with his left hand while he moves the file ahead a tooth at a time by turning the wheel with his right hand as shown in the figure. It is claimed that a file can be sharpened from four to six times with this device.

Edison Starter—A mechanical starter of the pedal operated, ratchet type is made by the Consolidated Gas & Electric Co., Chicago, Ill., for Regal, Studebaker, Krit, Overland and Ford automobiles. A pedal on the footboard operates a pawl which engages a ratchet gear on the crankshaft. By pressing the pedal the motor is turned over. The installation of this device requires only two hours' time and the use of a monkey wrench and a hammer. It is sold for $27.50.

Ideal Package—A complete outfit for repainting the automobile is supplied by Hanline Bros., Baltimore, Md., under the name of the Ideal Package. The package contains 15 different articles; everything that is necessary for repainting the automobile, including varnish, enamel, stain, dressing, sandpaper and brushes. Full directions are given for doing the job and it is claimed that the paint will dry over night.

Indiana Primer—One of the simplest devices for facilitating starting in cold weather is based on the fact that it is possible to buy gasoline in a drug store that vaporizes a great deal more readily than that supplied by garages, and is

Fig. 4—Vixen file resharpener, showing small emery wheel being swung between the teeth



Valentine differential: Fig. 1—Cross-section, heavy type. Fig. 2—Elevation, heavy type. Fig. 3—Elevation and part section, light car type

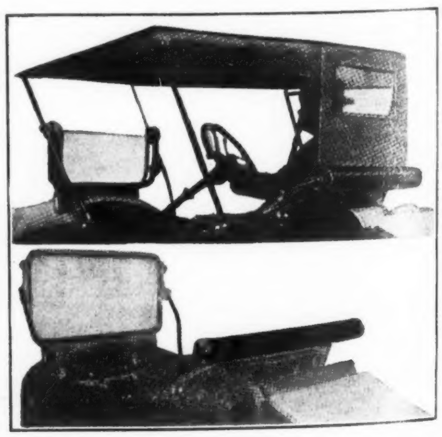


Fig. 5—Avery roll top. Upper view shows top extended. Lower gives idea of how top rolls up

LBA

TRADE MARK REGISTERED

STORAGE BATTERIES

INSURE THE EFFICIENCY OF STARTING AND LIGHTING SYSTEMS

The best electric equipment made would be worth but a few cents a pound without a dependable storage battery.

And, today, the car not equipped with electric starting and lighting is a back number.

To insure the utmost efficiency for their car owners, the LBA Storage Battery is furnished by the following manufacturers:

Adams-Bagnall Electric Co.	Cleveland, O.	Hartford Suspension Co.	Jersey City, N. J.
Adams & Westlake Co.	Chicago, Ill.	Holtzer-Cabot Electric Co.	Brookline, Mass.
Bailey Electric Co.	Grand Rapids, Mich.	Ide Engine Co.	Springfield, Ill.
Bijur Motor Lighting Co.	Hoboken, N. J.	Ignition Starter Co.	Detroit, Mich.
Briggs Magneto Co.	Elkhart, Ind.	Jones Electric Starter Co.	Chicago, Ill.
Dayton-Dick Co.	Quincy, Ill.	Kemco Elec. Mfg. Co.	Cleveland, O.
Dean Electric Co.	Elyria, Ohio	Leece-Neville Co.	Cleveland, O.
Detroit Electric Appliance Co.	Detroit, Mich.	National Coil Co.	Lansing, Mich.
Diehl Mfg. Co.	Elizabethtown, N. J.	North-East Electric Co.	Rochester, N. Y.
Dyneto Electric Co.	Syracuse, N. Y.	Northwestern Mfg. Co.	Milwaukee, Wis.
Economy Mfg. Co.	York, Pa.	Remy Electric Co.	Anderson, Ind.
Electric Auto-Lite Co.	Toledo, Ohio	Rushmore Dynamo Works	Plainfield, N. J.
Electro Light & Starter Co.	Indianapolis, Ind.	Splitdorf Electric Co.	Newark, N. J.
Emerson Electric Co.	St. Louis, Mo.	Wagner Electric Mfg. Co.	St. Louis, Mo.
Esterline Co.	Indianapolis, Ind.	Ward Leonard Electric Co.	Bronxville, N. Y.
Fisher Electrical Works	Detroit, Mich.	R. C. Wells Mfg. Co.	Fond du Lac, Wis.
Gray & Davis	Boston, Mass.	Westinghouse Elec. & Mfg. Co.	East Pittsburg, Pa.

COUNT THEM

and you'll see the LBA is the choice of the big majority.

Some of the VERY FEW manufacturers not in this list try to "put it over" on their customers by furnishing an imitation battery claimed to be "just as good" as the LBA.

Your electrical equipment is a highly important part of your car—on its successful operation depends your pleasure, your actual use of the car.

You cannot afford to buy a car whose manufacturers are willing to let you take a chance with any other battery than the LBA

5 LBA Branches, factory owned and operated and 150 real Service Stations in the United States stand ready to assist you in time of need.

WILLARD STORAGE BATTERY COMPANY

CLEVELAND, OHIO

New York Branch: 136 W. 52nd St.
Detroit Branch: 1191 Woodward Ave.
Chicago Branch: 2241 Michigan Ave.
San Francisco Branch: 243 Monadnock Bldg.
Indianapolis Branch: 438 and 439 Indiana Pythian Bldg.

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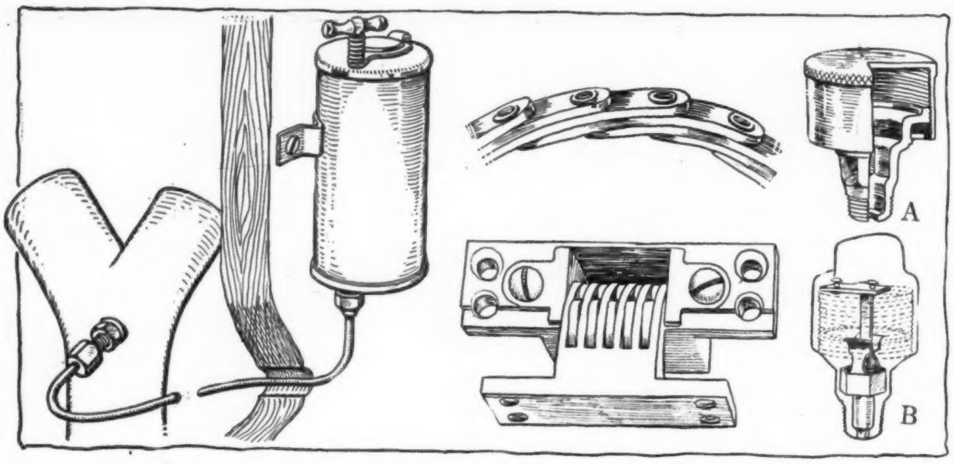

Fig. 6—Left, Indiana primer installed on dash. Fig. 7—Top, middle, Flexo belts. Fig. 8—Lower, middle, Soss invisible hinge. Fig. 9—Upper, left, Winkley leather washer grease cup; lower, left, Winkley ratchet grease cup

made by the Engineering Equipment Co., State Life Bldg., Indianapolis, Ind. It consists, Fig. 6, of a polished nickel tank to go on the dash, with a valve and tube leading to the intake manifold. The tank, which holds half a pint, is filled with "drug store" gasoline and the valve is opened slightly before the motor is cranked, and is left open until the engine is warm enough to run on ordinary gasoline. The primer may also be used for introducing kerosene into the cylinders to loosen up carbon.

Flexo Belts—The special point of merit possessed by Flexo belts is that they may be readily lengthened or shortened without special tools because of their laminated construction. Fig 7 shows how the belt is made so clearly that it is unnecessary to say more on this point except to mention that the belt takes a V-shaped pulley. Flexo belts are made from oak and chrome tanned leathers in widths varying from 5/8 to 1 1/8 inches and are suitable for fan, electric generator, self starter or cycle car drive. The Detroit Leather Works, Detroit, Mich., is the manufacturer.

Invisible Hinge—A new model hinge from the works of the Soss Mfg. Co., 435 Atlantic Ave., Brooklyn, N. Y., is illustrated in Fig. 8. Its special feature is that it can be installed in a body where a door pillar only 7/8-inch wide is used. These hinges can be installed flush with the outside of the pillar allowing the steel or aluminum panel to be turned over flush on to the face of the hinge. The hinge shown will carry doors up to 26 inches in width.

Winkley Grease Cups—Two grease cups of interesting design made by the Winkley Co., Detroit, Mich., are shown in Fig. 9. At A is a phantom view of the ratchet grease cup. The cap is held tight to the body of the cup by a tongue-like projection which fits into the flat spring jaws in the base. At B a quarter section of the leather washer grease cup is given. The special advantage claimed for the leather washer being that it keeps the grease from working out through the threads and at the same time provides a tension that keeps the cap from getting loose.

Motophone Horn—The Automobile Supply Mfg. Co., Brooklyn, N. Y., has just announced an interesting attachment for their mechanical horn, the Motophone. This device consists of a push button and cable by means of which the horn can be operated exactly the same

Fig. 10—Motorphone, a mechanical horn with push button

as an electric horn. The price of the largest size Motophone, with this attachment, is $15, and the smallest $8.

Cox Shock Absorber—The Cox Brass Mfg. Co., Albany, N. Y., maker of Cox rebound e-zers and other accessories has brought out the shock absorber shown in Fig. 11. This shock absorber, which replaces the spring shackle, consists of a pair of cylinders in which two pistons run, the cylinders being fastened to one main spring member and the pistons to the other. Between the piston and the upper cylinder head there is a slightly tapered helical spring which absorbs the road shocks. The idea in tapering the spring is to give it a greater range, the larger end compressing under slight pressure and the small end only when severe jolts are encountered. As indicated by the illustration, the absorber is made for both front and rear springs. Prices vary from $25 to $35, according to the size required.

Federal Double Cable Tires—The Federal Rubber Mfg. Co., Milwaukee, Wis., has brought out a tire, Fig. 12, whose feature is a double cable base. It is claimed that with this construction the cables take the circumferential strain imposed on the tire and therefore it is not necessary to use a hard bead filler in the base. It is said that when a hard filler is used the walls of the tire near the base rim-cut easily due to the lack of flexibility of the filler and that the double cable, soft filler construction eliminates trouble from rim-cutting.

Typhoon Horn—An electric signalling device that establishes a new low-price record for this type of instrument, in that it sells for $4, is the Typhoon, Fig. 13, made by the Typhoon Signal Co., 1391 Milwaukee avenue, Chicago, Ill. It is made in two styles, one with a flaring projector for mounting on the outside of the car and the other with a straight one for installing under the hood. The former type may be had in all black enamel, or black with brass or nickel trimmings, and the latter in black alone.

Norleigh Diamond Spark-Plug—The Shapleigh Hardware Co., St. Louis, Mo., is the producer of the spark-plug the cross-section of which is shown in Fig. 14. It will be noticed that this plug is made gastight without the use of asbestos by employing two packing rings, the lower one of which is made of copper and forms a tight joint between the porcelain and the shell of the spark-plug. The upper ring is swaged into the brass bushing which holds the porcelain in place. Meteor wire is used for the plug points. The section shows a patented slip-over terminal, but the ordinary type is furnished when desired.

Mysterious Rag—A specially prepared cloth, that is said to be not only a very efficient duster but also to impart a high polish to metal parts on which it is used, due to the ingredients with which it is impregnated, is made by the Gem Supply Co., New York, N. Y. Its special feature is that when it becomes dirty it may be washed without impairing its dusting or polishing qualities in any way. It comes in two sizes 25 to 36 inches and 36 by 54 inches, the former selling for 25 cents and the latter for 50 cents.

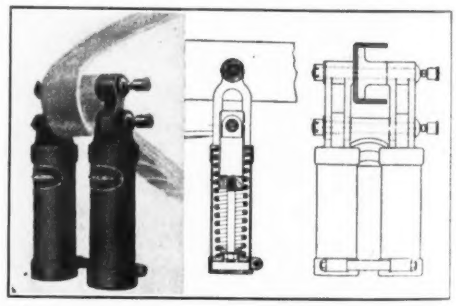

Fig. 11—Cox shock absorber. Left, showing attachment to rear spring. Center, vertical section, giving details of construction. Right, illustrating attachment to front spring

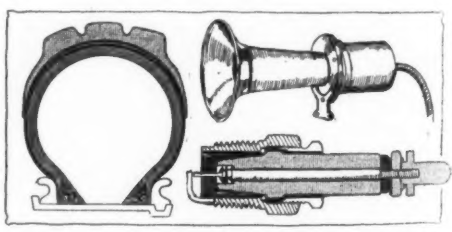

Fig. 12—Left, Federal tire with double cable base

Fig. 13—Top, right, Typhoon horn

Fig. 14—Bottom, right, Norleigh diamond spark plug